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PROCEEDINGS

OF THE

AMERICAN SOCIETY

OF

CIVIL ENGINEERS

VOL. XLV—No. 6

August, 1919

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AMERICAN SOCIETY OF CIVIL ENGINEERS

INSTITUTED 1852.

PROCEEDINGS

This Society is not responsible for any statement made or opinion expressed in its publications.

SOCIETY AFFAIRS

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MINUTES OF MEETINGS

OF THE SOCIETY

May 21st, 1919.—The meeting was called to order at 8.30 P. M.; D. Bontecou, M. Am. Soc. C. E., in the chair; Chas. Warren Hunt, Secretary; and present, also, 130 members and guests.

Joseph Dean Evans, M. Am. Soc. C. E., Vice-President of the Atlantic Loading Company, addressed the meeting on "Fixed Ammunition Loading, Inspecting, and Firing," illustrating his remarks with official moving pictures prepared by the United States Government. The details of the subject were explained further by Lt.-Col. H. C.

Davis, Jr., of the Explosives, Chemical, and Loading Division of the War Department, and Lt.-Col. Arthur Adams, M. Am. Soc. C. E., of the Ordnance Department, also spoke.

The Secretary presented an invitation from Mr. Walter R. Harper, Resident Representative of the U. S. Shipping Board, to members of the Society to attend the launching of the 3 500-ton concrete ship *Polias*, at North Beach, Long Island, on May 22d, 1919, at 4.30 P. M.

The Secretary announced the election of the following candidates on May 12th, 1919:

As Members

Frank Seymour Baillie, Portland, Ore.
Pierre Charton, St. Nazaire, France
Josiah Huntington Fitch, New York City
Frank McClellan Gunby, Washington, D. C.
George Trowbridge Hand, South Orange, N. J.
Winters Haydock, Washington, D. C.
Jules Joseph Hennebique, New York City
Edward Albert Kemmler, Akron, Ohio
Max Werner King, Buffalo, N. Y.
Richard Coke Marshall, Jr., Washington, D. C.
Warren Rabun Neel, Atlanta, Ga.
John Burchfield Neely, Kansas City, Mo.
Bunkichi Okazaki, Tokyo, Japan
Charles Edward Paul, Chicago, Ill.
Frank Edson Perkins, Brunswick, Ga.
Warren Russell Roberts, Chicago, Ill.
Paul Sterling, West Haven, Conn.
Joseph Boyer Townsend, Houston, Tex.
Clark Chittenden Wright, Washington, D. C.
George Stevenson Yates, London, England

As Associate Members

Arthur Rich Alling, McGehee, Ark.
Edwin Percival Arneson, Washington, D. C.
Roy Arin Badt, San Francisco, Cal.
Charles Nicholas Bley, Berkeley, Cal.
James Singleton Clay, Washington, D. C.
John Hamilton Cosby, Cambridge, Md.
James Edward Cuff, Edgewood, Md.
Paul Ashmore Daniells, Greenville, Pa.
Raymond Earl Davis, San Francisco, Cal.
Charles John Emerson, Groveland, Cal.
Abraham Epstein, Chicago, Ill.

ARTHUR LEE FERVER, East San Pedro, Cal.
PHILIP BRACKEN FLEMING, Camp A. A. Humphreys, Va.
FREDERICK GLAESER, Trenton, N. J.
LESTER CARLISLE GUSTIN, Cambridge, Mass.
FRED ERNEST HANSON, West Haven, Conn.
FRANK WILLIAM HARRIS, Renton, Wash.
RANDOLPH HARRISON, Lake Charles, La.
HENRY HARVIE, Toronto, Ont., Canada
RICHARD LANKASTER HEARN, Toronto, Ont., Canada
SOLOMON CADY HOLLISTER, Philadelphia, Pa.
CHARLES WARREN HUGHES, Port Arthur, Tex.
LEE HARVEY HUNTLEY, Tapoco, N. C.
HAROLD SUCESE JOHNSON, Chicago, Ill.
PRESCOTT VAIL KELLY, Pittsburgh, Pa.
HAROLD JULIUS LEVINE, New York City
SOLON BARON MANDELL, New York City
LESLIE STANCLIFFE MARSHALL, West Collingswood, N. J.
JOE BURROW MULLINS, Nashville, Tenn.
PATRICK HENRY MYERS, Cuyamel, Honduras
HARRISON WORTH NIGHSWONGER, Camp Funston, Kans.
BETHUEL SUTHERLAND OAKES, Wilmington, N. C.
CLARENCE EUGENE RIDLEY, Port Arthur, Tex.
JAMES TILLMAN RYAN, San Francisco, Cal.
GEORGE HENRY SARGENT, La Grange, Ga.
THORNDIKE SAVILLE, Hampton, Va.
WILLIAM JAMES SHEA, Hudson, N. Y.
CARLOS TEJADA SORZANO, La Paz, Bolivia
LYMAN ROBERT TALBOT, Muscle Shoals, Ala.
MARCUS PREVOST TAYLOR, Washington Barracks, D. C.
SAMUEL HOUSTON WARE, Honolulu, Hawaii
KINZIE LA MAR WEIMER, Camp Hancock, Ga.
RUDOLPH SIGMUND WEINER, El Paso, Tex.
FRANK HUBBLE WEST, Hilo, Hawaii
HERMAN CALVERT WITTE, Philadelphia, Pa.
WILLIAM SIDNEY WOLFE, North Glenside, Pa.

AS JUNIORS

WILLIAM JOHN CAMLIN, Green Bay, Wis.
JAMES APKER FOSTER, JR., Yellow Creek, N. C.
JAMES RINALDO GRIFFITH, New York City
JOHN EDWIN HARN, Baltimore, Md.
WALLACE BYRNE KANE, Joplin, Mo.
ALBERT WEIGAND LUHRS, Jersey City, N. J.
THOMAS FRANCIS MCSWEENEY, Philadelphia, Pa.

En-Chao Miao, Lee Hall, Va.
Louis Wellington Robertson, El Paso, Tex.
Clifton Kennady Wells, Jr., Baltimore, Md.

The Secretary announced the transfer of the following candidates on May 12th, 1919:

From Associate Member to Member

Fred Edward Caldwell, East Orange, N. J.
John Farris, Pittsburgh, Pa.
Frank Demetrius Hayden, Seattle, Wash.
John Gibson Hendrie, Fort Worth, Tex.
Frederick William Kassebaum, Jr., Baltimore, Md.
Luther Hammond Lewis, New York City
Albert Roy Olds, Havana, Cuba
George Sykes, Bayside, N. Y.
Byron Ellsworth White, Utica, N. Y.

From Junior to Associate Member

Clifford Aull Betts, Chattanooga, Tenn.
Harold Crusius Bird, Chester, Pa.
Edward Withers Bowen, Cleveland, Ohio
Janik Kevork Dirats, Bordeaux, France.
James Wightman Follin, Washington, D. C.
Edmond Anthony Fretz, Houston, Tex.
John James Gault, Chicago, Ill.
Lewis Adams Holborn, Am. Exp. Forces, France.
Harry Lichtenstein, Tullytown, Pa.
John Stalker Longwell, Denver, Colo.
Adolph Joseph Post, Camp Devens, Mass.
Leonard Hanscome Sinclair, Washington, D. C.
Isaac Yost Stauffer, Batavia, Java
Fred LeRoy Stearns, Norwich, Conn.
Joseph Joslin Strachan, Boston, Mass.
William Edward Whalen, Toledo, Ohio
Emmet Cheatham Wilson, Birmingham, Ala.

The Secretary announced the following deaths:

Hermon Charles Allen, of Boise, Idaho, elected Member, May 2d, 1911; died May 4th, 1919.

Adna Dobson, of Lincoln, Nebr., elected Member, May 6th, 1908; died May 4th, 1919.

Homer Peter Ritter, of Boston, Mass., elected Member, November 3d, 1915; died April 21st, 1919.

HERMANN FREDERICK AUGUST SCHUSSLER, of San Francisco, Cal., elected Member, February 4th, 1914; died April 27th, 1919.

CARL UHLIG, of San Francisco, Cal., elected Member, October 7th, 1903; died May 5th, 1919.

RAFAEL JOAQUIN TORRALBAS, of Santa Lucia, Oriente, Cuba, elected Junior, November 1st, 1910; Associate Member, June 24th, 1914; died September, 1918.

Adjourned.

June 4th, 1919.—The meeting was called to order at 8.30 P. M.; Vice-President Nelson P. Lewis in the chair; Chas. Warren Hunt, Secretary; and present, also, about 75 members and guests.

The minutes of the meetings of April 16th and May 7th, 1919, were approved as printed in *Proceedings* for May, 1919.

The meeting was devoted to an informal discussion on the organization of a Local Association of Members of the Society in the New York City District. The discussion was opened by D. L. Turner, M. Am. Soc. C. E., who was followed by Messrs. E. J. Mehren, Chas. Warren Hunt, S. N. Castle, T. Kennard Thomson, W. E. Belknap, E. T. Thurston, George H. Pegram, and T. Hugh Boorman.

The Secretary announced the following deaths:

HENRY BURGER SAUERMAN, of Chicago, Ill., elected Associate Member, May 1st, 1907; Member, May 31st, 1916; died May 20th, 1919.

NAOJI SHIRAISHI, of Tokyo, Japan, elected Member, October 4th, 1899; died February 17th, 1919.

EMIL SWENSSON, of Pittsburgh, Pa., elected Member, June 7th, 1893; died May 13th, 1919.

ALLEN EUGENE NICHOLS, of Chicago, Ill., elected Associate Member, October 10th, 1916; died May 8th, 1919.

BURT STIMSON, of Chicago, Ill., elected Associate Member, September 12th, 1916; died May 26th, 1919.

Adjourned.

FORTY-NINTH ANNUAL CONVENTION HELD IN ST. PAUL AND MINNEAPOLIS, MINN., JUNE 17th-20th, 1919.

FIRST SESSION.*

Tuesday, June 17th, 1919.—The meeting was called to order at the Radisson Hotel, Minneapolis, Minn., at 10 A. M.; R. D. Thomas, M. Am. Soc. C. E., President of the Northwestern Association of Members of the American Society of Civil Engineers, and Chairman of the Local Committee of Arrangements, presiding; Chas. Warren Hunt, Secretary; and present, also, about 200 members and guests.

Mr. Thomas introduced the Hon. J. A. A. Burnquist, Governor of Minnesota, who addressed the meeting and welcomed the members to the "Twin Cities."

President F. S. Curtis delivered the Annual Address.†

The Secretary presented a telegram‡ from Horace V. Winchell, President of the American Institute of Mining and Metallurgical Engineers, who had been invited to address the meeting on the "Mines of Minnesota", expressing regret at being unable to be present.

F. C. Shenehon, M. Am. Soc. C. E., addressed the meeting on "Engineering Activities of the Twin Cities."§

Adjourned.

SECOND SESSION—BUSINESS MEETING.‖

Tuesday, June 17th, 1919.—The meeting was called to order at 2 P. M.; President F. S. Curtis in the chair; Chas. Warren Hunt, Secretary; and present, also, about 220 members and guests.

The Secretary reported the result of the ballot on the proposed changes in the "Year Book" and the omission of "Changes of Address" in *Proceedings*.¶

The Secretary announced the election and transfer of candidates for membership by the Board of Direction on June 16th, 1919.**

On motion, duly seconded, the reading of the names of the candidates was omitted.

The Secretary presented the report of the Committee on Development,†† and stated that the report had been presented to the Board of

* For the Report in full of this meeting, see page 548.
† Printed on pages 437 to 442 of Papers and Discussions.
‡ See page 550.
§ See page 580.
‖ For the Report in full of the Business Meeting, see page 550.
¶ See page 550.
** See page 541.
†† See page 589.

Direction which had ordered printed copies to be sent to the membership of the Society and to the Local Associations, with the request that the benefit of individual or collective opinion on all fundamental points be communicated to the Chairman or Secretary of the Committee, in order that a further report might be prepared for presentation and discussion at the next Annual Meeting.

President Curtis announced that the report was before the meeting for discussion, and the subject was discussed by Messrs. Onward Bates, Gardner S. Williams, S. Everett Tinkham, Robert A. Cummings, Edgar S. Nethercut, John L. Hall, J. W. Alvord, Richard L. Humphrey, George F. Swain, L. D. Rights, W. H. Woodbury, Clarence Blakeslee, Hunter McDonald, C. F. Loweth, T. C. Hatton, A. F. Blaser, J. A. Ockerson, Chas. Warren Hunt, G. C. Mason, Charles Hansel, George G. Anderson, O. H. Dickerson, and A. N. Talbot.

The Secretary read a telegram* from Fraser S. Keith, Secretary of the Engineering Institute of Canada, who, with Brig.-Gen. Sir Alex. Bertram, Member of the Council of the Institute, had been invited to attend the Convention.

Adjourned.

ELECTIONS AND TRANSFERS BY THE BOARD OF DIRECTION, JUNE 16th, 1919

Elected as Members

Neil Stanley Buckbee, Buffalo, N. Y.
Walter Dennis, Moberly, Mo.
Joseph Hoover Fichthorn, Philadelphia, Pa.
Arthur Jay Grier, Oakland, Cal.
Andrew Harkness Harkness, Toronto, Ont., Canada
Peter Junkersfeld, Washington, D. C.
Edward Joseph Kelly, Chicago, Ill.
Judson Huntoon Merriam, Bridgeport, Nebr.
Albert Arthur Miller, Kansas City, Mo.
Frank Arthur Rapp, Seattle, Wash.

Elected as Associate Members

Peter Thornton Barrett, Washington, D. C.
George Whitney Bates, Lincoln, Nebr.
Frederick Max Beer, Brooklyn, N. Y.
George Adam Bengel, Springfield, Ill.
Charles Arthur Bissell, Washington, D. C.
Alexander Watt Blyth, Jersey City, N. J.
Frank Marvin Burr, Owensboro, Ky.

* See page 573.

Charles Chambers, Calgary, Alberta, Canada
Frank Joshua Clark, New York City
Charles Henri Coeytaux, Sanchez, Dominican Republic
Grey Willis Curtiss, South Braintree, Mass.
John Albert Dalen, Springfield Gardens, N. Y.
Robert Clark Dennett, New York City
Raymond Duerr, McGregor, Iowa
Charles Elcock, Philadelphia, Pa.
Richard Ellis, Boston, Mass.
Nathaniel Finestone, Minatitlan, Mexico
Andrew Fischer, Jr., Bloomfield, N. J.
Walter Arthur Fischer, Washington, D. C.
Charles James Folk, Phillipsburg, N. J.
Robert Lee Fox, Bethlehem, Pa.
Herbert Morgan Gallagher, Meridian, Miss.
George William Gates, New York City
Orval Lee Gearhart, Dixon, Ill.
John Glaettli, Jr., San Diego, Cal.
Grover Cleveland Green, San Francisco, Cal.
E. Ray Griffin, Mandan, N. Dak.
Roscoe Conkling Ham, Kansas City, Mo.
Kenneth Harrow Hanger, El Dorado, Ark.
Harwood Syme Haynes, Washington, D. C.
Peter Leo Hein, Chicago, Ill.
John Henry Hession, Cambridge, Mass.
Preston Thomas Hicks, Decatur, Ill.
Arthur Beers Hitchcock, Kansas City, Mo.
Frank Warne Hoff, Pittsburgh, Pa.
John Thomas Hopkins, New Brunswick, N. J.
John Wallace Johnston, Parkersburg, W. Va.
Geary Kimbrell, Pendleton, Ore.
Edward Leech, Jamestown, N. Y.
Nathaniel Morris Liddell, Topeka, Kans.
Nelson Johnson Lomax, Kansas City, Mo.
DeMont George Miller, Los Angeles, Cal.
Arthur Herbert Morrison, Boston, Mass.
Francis Barnard O'Connor, New York City
Scott Wesley Orr, Chelsea, Mass.
Olaf Otto, Savannah, Ga.
Charles Arthur Patterson, Torrington, Conn.
Earl Frost Reagan, Akron, Ohio
Clifton Rice, Richmond, Tex.
Joseph Michael Roeschlaub, Brooklyn, N. Y.
Hugh Rayner Seabrook, London, England

JACOB RALPH SHANK, Columbus, Ohio
KIRPAL SINGH, Jethuwal, India
ADRIAN CLYDE STANFIELD, Pana, Ill.
BENJAMIN STEIN, New York City
ERNEST ELBA SWOPE, Beaumont, Tex.
LUTHER RUDOLPH TILLOTSON, Topeka, Kans.
ROY OLLIN WALKER, Chicago, Ill.
RICHARD PARKER WALLIS, New York City
LLOYD DEWITT WALTER, Omaha, Nebr.
RALPH THEODORE WENSTRAND, Omaha, Nebr.
TIMOTHY SILAS WILLIAMS, New York City
LEF WINSHIP, St. Louis, Mo.
CLYDE WARREN WOOD, Oakdale, Cal.
JOHN YOUNG, Brooklyn, N. Y.
VRATISLAV ADOLPH ZEHR, Pekin, Ill.

ELECTED AS ASSOCIATES

FORD ASHMAN CARPENTER, Los Angeles, Cal.
WILLIAM CLARK IRWIN, St. Louis, Mo.
FRANK RABOLD WALKER, Chicago, Ill.

ELECTED AS JUNIORS

HARRY LEWIS BAYER, Temiskaming, Que., Canada
MICHAEL JOSEPH BURKE, Indianapolis, Ind.
FREDERICK CONRAD GAMSU, New York City
GENE BRYANT HEYWOOD, Pasadena, Cal.
JOSEPH JAROMIR KUCHAR, Muscle Shoals, Ala.
BENJAMIN LEVEY, Middleboro, Mass.
BYRON CASPER MCCURDY, London, England
EDWIN NEWBURGER SEYMOUR, Am. Exp. Forces, France
CLAUDE WELLINGTON SOPP, Pasadena, Cal.
MISSAC THOMPSON, New York City
PAUL AMOS VICKERS, Kansas City, Mo.

TRANSFERRED FROM ASSOCIATE MEMBER TO MEMBER

ROBERT EDWARD BARRETT, Turners Falls, Mass.
LYMAN EDGAR BISHOP, Denver, Colo.
EUGENE BRADFORD BUMSTED, Berkeley, Cal.
JOHN WESLEY CORNELL, Washington, D. C.
JOHN KRAMER FLICK, Baltimore, Md.
CHARLES EDWARD GILMAN, Oakland, Cal.
LUKE JOSEPH HAYES, Niagara Falls, N. Y.
ALFRED BRACKENRIDGE HEISER, Brooklyn, N. Y.
JOHN STRIDER HESS, Chicago, Ill.

ALBERTO ANGEL IBARGUEN Y PI, Pinar del Rio, Cuba
ROBERT HYDE JACOBS, New York City
JOHN MONROE JOHNSON, Marion, S. C.
JOHN EDWARD KIRKHAM, Ames, Iowa
EUGENE CLYDE LA RUE, Pasadena, Cal.
CHARLES HAMILTON LEE, Berkeley, Cal.
JOHN HENRY MADDEN, New York City
GROVER JOHN MEYER, St. Lambert, Que., Canada
GEORGE EDWARD PELLISSIER, Springfield, Mass.
EDGAR KINGSBURY RUTH, Cincinnati, Ohio
CURLYS LYON SLOCUM, Springfield, Mass.
LESLIE WRIGHTSON STOCKER, San Francisco, Cal.
SAMUEL WRIGHT TAY, New London, Conn.
BENJAMIN THOMAS WESTON, Temiskaming, Que., Canada

TRANSFERRED FROM JUNIOR TO ASSOCIATE MEMBER

BENJAMIN JOHN CURTIS, Blue Island, Ill.
CHARLES EDMUND DE LEUW, Chicago, Ill.
ROLAND RUSSELL GRAHAM, Philadelphia, Pa.
PHILLIP WHEELER KNISKERN, Chicago, Ill.
SYDNEY BISHOP LAMB, Denver, Colo.
WILLIAM DURKEE SMITH, Tacoma, Wash.
GEORGE ALBERT TILTON, San Luis Obispo, Cal.

OF THE BOARD OF DIRECTION

(Abstract)

June 16th, 1919.—The Board met at 10 A. M., at the Hotel Radisson, Minneapolis, Minn., at the time of the Annual Convention, as required by the Constitution; President Curtis in the chair; Chas. Warren Hunt, Secretary; and present, also, Messrs. Alvord, Crocker, Darling, Elwell, Flinn, Grunsky, Hawgood, Ketchum, McDonald, Metcalf, Pegram, Rights, Talbot, Tuttle, and Wagner.

A report* from the Finance Committee was received, and the appropriation recommended for the re-cataloguing of the Engineering Societies Library ($2 500 for the current year), was approved.

A report† from the Library Committee was received, and after a discussion of the question of the ownership of the books in the Engineering Societies Library, the following resolution was adopted:

"Resolved: That the Board of Direction of the American Society of Civil Engineers recommends to United Engineering Society that suitable legal steps be taken to transfer to United Engineering Society the legal title to all books in the Engineering Societies Library now owned by the several Founder Societies."

* See page 681.
† See page 683.

A report from the Publication Committee was received.

The Secretary reported the result of the canvass of the ballot on changes in the "Year Book" and the omission of "Changes of Address" in *Proceedings*,* and the Publication Committee was instructed to carry out the result of this ballot.

A report† from the Committee on Special Committees was received and adopted. This report included the discharge, at its own request, of the Committee on Reconstruction; the appointment of a Special Committee on Highways, etc.

By invitation of the Board, Past-President Onward Bates, Chairman of the Committee on Development, presented the Second Progress Report of that Committee.‡

The following resolution was adopted:

"*Resolved:* That the Progress Report of the Development Committee be received and ordered presented to the Business Meeting of the Convention, in printed form if possible, and subsequently forwarded to the entire membership and to each Local Association of Members, with the request that the benefit of individual or collective opinion on any or all fundamental points be communicated to the Chairman or Secretary of the Committee."

It was moved, seconded, and carried:

"That the Committee on Development be authorized to hold an additional meeting, in order to prepare a further report to be in the hands of the Secretary of the Society by November 1st, 1919, so that it may be issued to the membership sufficiently in advance of the Annual Meeting to insure a thorough discussion of it at that meeting."

Mr. Bates stated that, at the request of one of the members of the Executive Committee of the Committee on Development, he asked the Board for the privilege of adding certain explanatory matter which should also be printed and sent out to the membership with the report of the Development Committee.

Mr. Bates' request was granted, and the following resolution was adopted:

"*Resolved:* That the Committee be authorized to add such explanatory matter to the report and print it and send it out with the report as may meet with the approval of the Chairman of the Publication Committee."

A motion to the effect that Mr. Bates be requested to continue as Chairman of the Development Committee was unanimously carried.

Adjourned 1 P. M.

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* See page 550.
† See page 685.
‡ See page 589.

The Board reconvened at 8.10 P. M., on the adjournment of the Membership Committee; President Curtis in the chair; Chas. Warren Hunt, Secretary; and present, also, Messrs. Alvord, Crocker, Darling, Elwell, Flinn, Grunsky, Hawgood, Ketchum, McDonald, Metcalf, Pegram, Rights, Talbot, Tuttle, and Wagner.

A report was received from the Committee appointed by the President to confer with similar committees of the other National Engineering Societies and to report on the formation of a Franco-American Engineering Committee, its scope and purpose, manner of operation, etc., with recommendations, and on motion, duly seconded, the report was adopted, and the Committee continued.

The Secretary reported that Messrs. George S. Webster, H. H. Porter, and A. Marston had accepted appointment as representatives of the Society on the Engineering Division of the National Research Council; that Robert A. Cummings had accepted appointment to represent the Society on the American Welding Society; and that Messrs. Albert S. Crane, Ralph Modjeski, and Arsène Perrilliat had accepted appointment as a Committee to Recommend the Award of Prizes for this year.

Francis R. Weller, M. Am. Soc. C. E., was asked to represent the Society at a public conference on business training for engineers and engineering training for students of business, to be held in Washington, D. C., on June 23d-24th, 1919.*

The following resolution which had been adopted at an informal conference of the Presidents and Secretaries of the Founder Societies held on April 29th, 1919, was presented:

"*Whereas:* Requests for funds for various joint activities of the Founder Societies, are received from time to time after the Societies have adopted their annual budgets; and

"*Whereas:* Prompt and harmonious action upon such requests is desirable for effective co-operation,

"*Voted:* To recommend to the governing bodies of the four Societies that a Founder Societies' Finance Committee on Joint Activities be appointed, consisting of two representatives from each Founder Society, one of whom shall be the Chairman of the Society's Finance Committee, and that to this committee shall be referred for consideration and recommendation, before action by any of the governing bodies, all requests for finances for joint activities."

On motion, duly seconded, Nelson P. Lewis, Chairman of the Finance Committee, and Chas. Warren Hunt, were appointed to represent this Society on the Founder Societies Finance Committee on Joint Activities.

Upon the request of United Engineering Society for an additional appropriation of $6 000 for the use of the Engineering Societies

* See page 698.

Employment Bureau, the Treasurer and Secretary of the Society were authorized, the other Founder Societies concurring by similar action, to commit the Society to an expenditure not exceeding $1 500 for the use of the Engineering Societies Employment Bureau, in addition to previous appropriations through Engineering Council for the present calendar year.

The following resolution was adopted:

"*Whereas:* The question has been raised as to the right of a Trustee of United Engineering Society, appointed by the Board of Direction of the American Society of Civil Engineers, to vote in accordance with his own views and in opposition to the directions of this Board.

"*Resolved:* That the representatives of this Society on the Board of Trustees of United Engineering Society are subject to the instructions and must reflect the will of this Board in all matters when such will has been officially expressed and communicated to them.

"*Resolved, Further:* That a prompt expression of the intentions of each of the present Trustees with respect to this matter is requested."

The following resolution was adopted:

"*Resolved:* That a Committee consisting of the five latest living Past-Presidents, the President, and the four Vice-Presidents, be appointed to nominate for election to the grade of Honorary Member such persons, not more than seventeen in number, as they may unanimously agree upon, who, under the Constitution, may properly be credited with this distinction."

The resignations of 3 Juniors (one effective December 31st, 1919) and 1 Associate Member were accepted.

Ballots for membership were canvassed, resulting in the election of 10 Members, 66 Associate Members, 3 Associates, 11 Juniors, and the transfer of 7 Juniors to the grade of Associate Member.

Twenty-three Associate Members were transferred to the grade of Member.

Applications were considered and other routine business transacted.

Adjourned.

FORTY-NINTH ANNUAL CONVENTION, HELD IN ST. PAUL AND MINNEAPOLIS, MINN., JUNE 17th-20th, 1919.

FIRST SESSION

Tuesday, June 17th, 1919.—The first session of the Annual Convention was opened in the Gold Room, Mezzanine Floor, of the Radisson Hotel, Minneapolis, Minn., at 10 A. M.; R. D. Thomas, M. Am. Soc. C. E., President of the Northwestern Association of Members of the American Society of Civil Engineers, and Chairman of the Local Committee of Arrangements, in the chair; Chas. Warren Hunt, Secretary; and present, also, about 200 members and guests.

THE CHAIRMAN.—Ladies, and Members of the American Society of Civil Engineers: The local members of the Society welcome you to-day. We have been waiting a long time for this pleasure, in fact, for two years. A little more than two years ago, we were informed that we were to have the pleasure of entertaining you in June, 1917. We made our arrangements, but before they were consummated, the war came on, and, as you all know, that meeting was postponed, and this is the first summer convention held since that time. On the programme for that occasion, we had the Governor of Minnesota down for the address of welcome. We have given him two years to prepare that speech for you. I now take great pleasure in introducing Governor John A. A. Burnquist.

GOVERNOR BURNQUIST.—Members of the American Society of Civil Engineers: It is an unusual pleasure for me to extend to you the cordial welcome which I offer on behalf of our State. I wish it were possible for us to show it to you as we would like to, and for you to view its 10 000 beautiful lakes, its winding streams, and wooded hills. I wish it were possible to take you over our 20 000 000 acres of agricultural lands on which are growing our immense crops, and also our 30 000 000 acres not yet under cultivation, but which we hope will be before many years have passed, through the services of the engineers of this State and nation.

I see by your programme that you are to visit the north-eastern section of our State. I hope that you will all be able to go, for there you will find men digging down into the depths of the earth, taking out of it a mineral which is being manufactured into products that are marketed throughout the length and breadth of the United States and of the world.

We, in this State, like to boast of what we have, just as men everywhere like to boast of whatever State, territory, or community, in which they live. Not long ago, I was down in Kansas, and the people there seem to be quite boastful about Kansas. While there a college president

told me of an incident which may interest engineers. On one occasion, two or three men were sitting chatting together on a railroad train, and each was boasting at considerable length about the wonders of his particular community. One of them was especially enthusiastic about his home city, and said that all it needed to make it one of the greatest cities in the country was a seaport. "Well," said a man in the seat in front of them, "you will have no trouble in getting a seaport. All you have to do is to lay a pipe line to the Gulf of Mexico, and if you are as good at sucking as you are at blowing, you will have no trouble in getting a seaport."

We all like to boast of our respective Commonwealths; we all like to boast of the particular community in which we live; but I am sure that, proud as we are of our different States and Territories, we take still greater pride in our common country—the United States of America.

To-day as we are gathered here from different States and Territories all of us rejoice in the fact that, regardless of where we have come from—whether from the Pacific slope or the Atlantic coast, north or south—we live in a united country, under a government which is back of our States and back of all our institutions, where we feel that the people of the whole of the United States are the real power and the real sovereignty.

So we of Minnesota, one of the many States of the Union, welcome you here. We are glad to have you with us and know that while you are here, your conferences will be of benefit not only to your Society, but to our own State and to our beloved, common country. During the recent war you did much in connection with serving your country. I understand that one-sixth of your membership was in the service of the nation at that time. This number constituted more than 1 500 of your 9 000 members. They fought for the advancement of the ideals of the American Republic, and were men of skill and genius, who were not working for that selfish ambition for which our enemies were struggling. Their ideals were entirely different from those of the European warlords, who were striving for the gratification of their own selfish ambition and were willing to sacrifice on the fields of battle thousands of innocent victims, regardless of the rights of their fellow men.

By reason of the winning of the war, I believe we are entering on a new era in your profession; that is also true of other professions, of other lines of business, but it is especially true, I believe, of the Engineering Profession. Thirty-six years ago, this Society had a meeting in Minneapolis, and those of you, if any, who were here at that time, will realize the progress Minnesota has made during those 36 years. We are going to advance still further. We feel there is no limit to the aspirations of men. No sooner is one high aim attained than others appear in view to be sought for and worked for. No sooner do we climb one mountain peak than we find ourselves gazing at others in

the distance. Let us all continue to strive onward and upward, working to make this, as it is now and shall continue to be, the greatest nation in the world.

THE CHAIRMAN.—I wish to say that Governor Burnquist is an Executive who appreciates engineers. During his administration, he has shown this by appointing them to serve in different capacities. We all appreciate it and are doing what we can to see that he makes good appointments.

President Curtis needs no introduction to the members of this Society. I take great pleasure in stepping aside that you may enjoy listening to him.

President Curtis presented the Annual Address.*

THE SECRETARY.—Mr. President, I have the following telegram of regret from Horace V. Winchell, President of the American Institute of Mining and Metallurgical Engineers, who was to have addressed the meeting on "The Mines of Minnesota:"

"BUTTE, MONT.
"CHARLES WARREN HUNT,
"29 West 39 St., New York, N. Y.

"Much regret that western engagements prevent my addressing Civil Engineers in Minneapolis June seventeenth.

"H. V. WINCHELL."

F. C. Shenehon, M. Am. Soc. C. E., delivered an address on the "Engineering Activities of the Twin Cities."†

Adjourned.

SECOND SESSION, BUSINESS MEETING

Tuesday, June 17th, 1919.—The meeting was called to order at 2 P. M.; President Curtis in the chair; Chas. Warren Hunt, Secretary; and present, also, about 220 members and guests.

THE PRESIDENT.—The Secretary will please read the result of the ballots on the proposed changes in the "Year Book", and the omission of "Changes of Address" in *Proceedings*.

The Secretary read the report, as follows:

"33 West 39th Street,
"New York, N. Y.,
"June 4th, 1919,

"TO THE BOARD OF DIRECTION:

"The undersigned appointed by the Chairman of the Publication Committee as teller to canvass the ballots on:

No. 1. Changes in 'Year Book',

No. 2. Omission of 'Changes of Address' in *Proceedings*,

reports as follows:

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* See page 437 of Papers and Discussions.

† See page 580.

"Total number of ballots received		2 278
"Ballots without signature		19
"Ballots canvassed		2 259
"No. 1. Changes in 'Year Book':		
Yes	1 920	
No	327	
Not voting	12	
"No. 2. Omission of 'Changes of Address' in *Proceedings:*		
Yes	1 831	
No	417	
Not voting	11	

"Respectfully submitted,

"CHAS. WARREN HUNT,

"Secretary."

THE SECRETARY.—Mr. President, I wish to announce the election and transfer of candidates by the Board of Direction on June 16th, 1919.*

(On motion, duly seconded, the reading of the list of candidates was omitted.)

THE PRESIDENT.—The next in order will be the reading of the Report of the Development Committee.

The Secretary read the Report of the Development Committee.†

THE SECRETARY.—Mr. Chairman, I may say that this report was presented to the Board of Direction which adopted a resolution to the effect that it should be presented to this Business Meeting of the Society, and that it should be printed and forwarded, at the earliest possible moment, to every member of the Society and to all the Local Associations, with the request that, individually or collectively, any information, opinion, or discussion of the points brought out in the report be communicated to the Chairman or the Secretary of the Development Committee, in order that the Committee may be able to formulate a report to be placed in the hands of the Secretary, under the constitutional limitation, on or before November 1st, 1919. This further report—perhaps final and perhaps not—may then be sent to the entire membership of the Society in sufficient time in advance of the next Annual Meeting, to enable those present at that meeting to discuss it with a full knowledge of all that has been brought out.

THE PRESIDENT.—I want to say, Gentlemen, that the Secretary has correctly stated the situation, as I understand it. The report was submitted to the Board of Direction yesterday by the Chairman of the

* See page 541.
† See page 589.

Committee, who stated that it was practically tentative. I want to thank the members of the Committee for the work they have done in preparing this report; it is a very interesting one, but, as I have previously stated, not complete. The Board of Direction at its meeting authorized an additional outlay to pay for a future meeting of the Development Committee, in order that it may prepare a definite report to be submitted previous to the Annual Meeting. This report is now before you for discussion. I think there may be variance of opinion, and, as I have already said, the Committee does not consider it a final report. The Committee has been at work on it for a week and has made much progress. The Board of Direction has authorized it to be printed and sent out to the members of the Society in order to get their opinions to help the Committee in presenting a definite report to the Board previous to the Annual Meeting, when it will be considered.

A MEMBER.—I notice a number of things in the report which are not in accordance with the Constitution. I do not see how they can be adopted without conforming to the Constitution.

THE PRESIDENT.—I think the Committee understands that they cannot be adopted without changing the Constitution.

ONWARD BATES, PAST-PRESIDENT, AM. SOC. C. E.—With regard to the specific question, and, generally, I wish to say something and get it off my mind. First, if I should happen to leave this meeting, I hope you will all understand it is simply and solely because the atmosphere in this room is such that it makes my head swim; it seems almost unbearable to spend an hour here. I feel a little dizzy now.

Now, Mr. President and Gentlemen, with regard to this report: Speaking as Chairman of the Committee, I will say that with a committee of twenty-eight, scattered in many directions, it was almost impossible for the Chairman to perform any other duty than that of administrative officer, and he has only fulfilled that office by having a most capable and willing Secretary to do the work. Therefore, when you come to the details of this report—there are a great many of them —I hope, for the sake of humanity, you will not undertake to discuss them all to-day. When it comes to those details, however, I will say that the men who actually did the work on the report know more about it than the Chairman. I am sure that the Chairmen of three of the Sub-Committees are present, and those who took the most active part in the preparation of the report, with a few exceptions, are also in this audience, and, Mr. President, it will be a great deal better to get the information in detail from those who wrote it and presented it at the joint meeting of the Committee.

THE PRESIDENT.—I will call on Mr. Gardner S. Williams.

GARDNER S. WILLIAMS, M. AM. SOC. C. E.—Mr. President, to my mind the essence of this report can be summed up in a very few words.

First, in regard to our internal affairs: We propose that the members of the Board of Direction shall be elected by the corporate members in the districts which they represent. The only way in which we have been able to think of bringing that about is by making every member of the Society a member of a local association, and then by affiliating those associations in the districts by some form of organization that will assure to every member in the district an opportunity to make himself heard in the selection of the members of the Nominating Committee and the Board of Direction from that district. We have not gone into the full details of that organization. We send the thought out to learn whether or not it is agreeable to you. And, obviously, if every member of the Society is to be a member of a local association, then a portion of the dues which he pays to the National Society should go back to the local association in order to provide for its expenses. So that, so far as this Society and the other National Societies are concerned, they should continue, as in the past, to devote their energies chiefly to the technical affairs of engineers as engineers. We say, however, that there should be formed a general organization of engineers to take in all engineers, and we begin at the bottom: We say to our local associations, get together with the local associations of other Societies; and to our associations and the local associations of other Societies, get together with the engineers' societies of your localities, wherever you are, and if there are any scattering engineers not connected with any society, get them into a general local organization for the purpose of bringing their influence to bear in civic affairs. And we say to those local organizations or affiliations, as we have called them, get yourselves together in a State organization, by delegates, or otherwise. And then we try to form a National council, composed of representatives of the National Engineering Societies as such, and of representatives of the State organizations to which we have just referred, either as State organizations, or as individual societies or groups of societies, as the members may decide.

In brief, those are the two main points of this report. It also emphasizes the fact that the engineer should participate actively in civic affairs in his community. That has been said so often, that it is almost too trite to repeat, but we have put it on record once more.

To summarize, the proposal is to affiliate all engineers in a way similar to that already in effect for furthering a National Department of Public Works, and I may say in passing that an Act is already drawn to create such a Department, in which there shall be assembled all the engineering activities of the General Government, which legislation should have the active support of every engineer.

I have presented what, to my mind, are the main issues of this report. The rest is necessarily more or less detail. We realize that changes in the Constitution must be made, but before we start to

make them, it is the thought of the Development Committee that the issuance of a series of questions covering the points which we have taken up, or will take up in our final report, questions submitted to the membership of the Society, will bring out statements and opinions which will enable us to ascertain whether or not the membership is willing to follow us in the proposals we have made. If not, we, or some other development committee, should start over again and formulate a programme which the members are prepared to follow. I thank you.

THE PRESIDENT.—I would like to ask Mr. Tinkham if he has anything to say.

S. EVERETT TINKHAM, M. AM. SOC. C. E.—Mr. Williams has covered so fully the work of the Committee and given in a brief and condensed form, what the Committee had in mind in preparing the report, that I do not think I can add any information of importance at this stage of the discussion. What the Committee desires is the opinion of the members on the preliminary report now before them.

ROBERT A. CUMMINGS, M. AM. SOC. C. E.—Mr. President and Fellow Members of the Society: Perhaps I may supplement the remarks of Maj. Williams by referring to technical development.

Our Society is exclusively a technical organization and in the past has been administered as such. Superior technical work requires that its activities remain in control of the older and more experienced members of the profession. Therefore, whatever development or extension is proposed must require this control as its fundamental feature.

On the contrary, the Development Committee has submitted to you the proposal (and it has met with encouragement) that the activities of the Society should be extended into welfare work and to the National domain of public endeavor. For this purpose, the basis for organization and administration must be placed in control of the rank and file of the members of the profession.

The report is a harmonizing of these two principles in a single organization, by adopting fundamentals to govern the development for any future scheme of organization.

The idea of the Technical Sub-Committee is that there shall be no relinquishment of our technical position, but rather an effort to improve and extend our activities into neglected fields, research, etc. The common ground on which we are brought together in this Society is that of mutual technical interests, and these must be maintained.

THE PRESIDENT.—Is Mr. Darling present?

THE SECRETARY.—I suggest that Mr. Nethercut, the Secretary of the Western Society of Engineers, and a member of the Committee on Development, give us his ideas.

EDGAR S. NETHERCUT, M. AM. SOC. C. E.—In considering the work of the Committee on Development, I believe that we are ready, at this time, to submit what might be called a proper cross-section of our views. The first meeting of the Committee did not develop ideas in a sufficiently clarified form to make them worthy of presentation. We now have before us in this report many things which a number of our members will be glad to see. It may present some things which we are not now ready to accept, and further discussion and enlightenment by the membership will enable the Committee to draw up a final report. The methods of organization proposed have been sufficiently outlined to make them clear.

It is clearly set forth in the recommendations that the American Society of Civil Engineers shall continue to be, as it has for the last sixty years, the pre-eminent standard for the Engineering Profession and practice. This should not be neglected, and cannot be omitted, if we are to succeed. The one thing that impresses me with regard to this report is, that however fine a plan of machinery we may set up for the organization of the American Society of Civil Engineers, unless that machinery is propelled by the spirit of service and co-operation on the part of every member, it will be futile.

I am sure we all agree that this report is progressive. I am impressed with the earnest manner with which it is received. The spirit of service must be maintained, and the opportunity now presented in a larger way than ever before, will enable every member of the Society to participate fully in its affairs. This means that the present generation will have a like opportunity as generations which have gone before, who did not render service, and by so doing be an inspiration to us all; in fact, even greater opportunities are now presented to our members.

THE PRESIDENT.—I would like to call on the representative from the Pacific Coast, Mr. Hall. Is he present? If so, will he please come forward?

JOHN L. HALL, M. AM. SOC. C. E.—I do not feel it essential that I should come forward, because I feel very strongly that the Committee on Development would rather hear from the membership present than otherwise. I think so far, the subject has been well covered and developed. I can only say to you, since I have been called forward as a representative from the Pacific Coast, that we, of the Coast, are heartily in accord with the report of the Committee. The representatives from the Coast—and there are a number—have worked hard and come a long way, and we are entirely satisfied and pleased with the result.

I think that we all would like to hear more from the representatives here personally—from the membership of the Society as a whole—particularly we of the Coast. We are so scattered out there that it is

difficult for us to know the feeling of the membership. The organization of a local association has given us an opportunity to get together and crystallize our views, but we remember that we are in the minority and that the views of the majority must prevail. Speaking, therefore, for the Coast, I repeat that we would like to have an expression from the membership here present, who are not members of the Committee on Development.

THE PRESIDENT.—I have called on one or two members of the Committee, because I wanted those present to get an idea of what the Committee has done, and the reasons for it. As I told you in the beginning, this whole matter is to be submitted again for final action. The Board of Direction has ordered this report printed and issued immediately, in order to get suggestions for the Committee, so that it may revise them or revise the report, as it sees fit. I think it would be wise to hear from any one who desires to say anything on the subject. The matter is now practically open for discussion. We would be glad to hear from any one who desires to say anything in the matter.

JOHN W. ALVORD, M. AM. SOC. C. E.—As one of the original Bolshevists who started the idea of the Development Committee, I am pleased with its report. Secretary Hunt says that, "a Bolshevist is a man who wants something, but does not know exactly what he wants." I think, perhaps, in Society matters I can qualify under that definition.

We are all greatly impressed, since the war, with the tremendous impetus given to the Profession of Engineering, by the great engineering need of the Government and its call to the engineers of the country and their splendid response. We all feel that the time has come when this country should know more about the Engineering Profession, and that the Engineering Profession should take a more advanced place than ever before. When we undertake to make some concerted move, however, we find that the Engineering Profession is divided into different technical activities which seem to develop into vertical cleavages, and we also find that it is much divided into horizontal cleavages by societies for the young men, societies for the betterment of university professors, and societies for the promotion of various grades of activities of many kinds.

Now, I deprecate both these vertical and these horizontal cleavages, because I want to see all parts of the Profession united, so that the technical activities of this country are so welded together that we shall strongly and rightfully take the place in the nation which we should occupy for our service to the country's best good and for any call that the country may make on us; and I hope that this report of the Development Committee will be a long step in this direction.

In regard to two headings of this report, I find myself asking some questions; possibly it is premature to ask for too much detail at this time, yet I presume that we must feel our way along, and I suppose

that the Committee has felt its way along a little farther than the rest of us.

In reading the report, and noting the dual organization that has been proposed and which has been described by one of the speakers—the technical activity from the top down, and the welfare purposes from the bottom up—I do not see quite clearly how these two organizations work together in the higher National affiliation. I observe that we have the recommendation for the united local association and we have the recommendation for a State representation. Now, where does the technical society—presumably, we will say, in this case, the American Society of Civil Engineers—cease to function through the welfare purpose in its dues, its duties, and its elections? I would be very glad if some member of the Committee would make it just a little clearer to us.

THE PRESIDENT.—Mr. Alvord has asked a question. Does any member of the Committee desire to answer it?

RICHARD L. HUMPHREY, M. AM. SOC. C. E.—The line of separation between the two organizations is at the local association. In other words, the local association of this Society functions, through the district organization of the Society, in all administrative and directly in all technical matters with the Society; while in non-technical matters or welfare work, if you please, the local association functions with the local associations or sections of other National Engineering Societies, of the local engineering societies, and the local engineers, through the State organization to the National council. They are substantially two separate organizations, their only common point being the local association of the members of this Society for carrying on its technical work, which local members co-operate with the members of other local associations or sections of the National Engineering Societies, of the local engineering societies, and the local engineers, in forming the local group or affiliation for carrying on welfare work. The Society is interested in this welfare work at the bottom through its members in the local affiliations, and at the top through its direct representation on the National council.

MR. ALVORD.—Then the National organization is the great society of all societies—as distinguished from the American Society of Civil Engineers which claims to be the technical society in civil engineering matters?

MR. HUMPHREY.—Yes. Except, it should be clearly pointed out, that the National Engineering Societies are interested in welfare work for the engineer, and will exercise a restraining influence on the National council through their representation on it.

THE PRESIDENT.—Is there any one else who cares to discuss the matter at present? As I told you in the beginning, I understand from the Chairman of the Committee that this is just a tentative report. It

is a very good one, and one which the Committee was desirous of placing before the Board meeting yesterday; but there are many things which the Committee is anxious to have discussed—for use at further meetings—and this discussion will help the Committee.

GEORGE F. SWAIN, PAST-PRESIDENT, AM. SOC. C. E.—I have only read this report once, or rather listened to it, and I do not like to discuss a thing without more careful consideration. I am very pleased with the report, however, and thoroughly in sympathy with almost all of it. With all the big things in it, I am entirely in sympathy, so far as I have had time to consider them. There were, however, two or three little things that occurred to me, as I listened to it, which it may be worth while to mention. The first is with reference to licensing engineers. That paragraph provides that the Society, in co-operation with other societies, prepare a standard form of bill for the licensing of engineers, "to be used in the framing of legislation." Now, I have no objection to a standard form of bill; but when it says "to be used in the framing of legislation", that seems to me clearly to imply that this Society favors and intends to advocate and promote such legislation, and, up to the present time, I have been against the licensing of engineers. If we are to be licensed, there ought to be a proper bill, but it seems to me that we are not ready to advocate this, and that the report should read, "to be used in the framing of legislation if necessary", or something of that kind. I submit that for the consideration of the Committee, because it seems to me that the present wording implies directly that this Society favors the licensing of engineers.

The second thing that occurred to me was something of a similar character—in regard to legislation and the development of natural resources. It says that the National council shall maintain an agency, etc., so that proper legislation may be enacted. That is all right; but there is another thing more important than that, and, that is, that improper legislation shall be defeated. There is much more danger, it seems to me, in this country at the present time, from improper legislation being enacted, than there is of not enacting proper legislation. We have too much legislation, I think. I am a great believer in letting things work themselves out. I think this idea ought to be brought in somewhere, to the end that not only proper legislation may be enacted, but that improper legislation may be defeated.

The third item was in reference to the code of ethics to be prepared. I think a code of ethics, if intended to be enforced, is usually negative, and that is the proper way. I think the council would find it difficult to get a short positive code—a short code which would cover all the things a man ought to do. You can get a much shorter code if you will lay down a few general principles or things he ought not to do. A code of ethics may be a good deal of a farce, any-

way, if it simply consists of positive generalities. You have got to assume that a man has moral character, that he can recognize what is right without having it put down on paper; and if he cannot do that, no code will do him any good. It would be much better to state clearly the things a member of the Society ought not to do, and I think it would be rather demeaning to the Society to try to lay down a statement of all the things its members ought to do. Such a list would naturally include a great many things that every one would know he ought to do, and what is the use of putting them in? There is a contradiction between a "short code" and a code of "positive character." Personally, I think the present code of ethics is a good one, if it is made clearly enforceable, so that if a man violates it, he may be punished.

L. D. RIGHTS, M. AM. SOC. C. E.—This report provides for a great extension of the activities of the Society. Article 1, Section C, recommends four meetings each year of the local associations, and provides for four general meetings a year of the Parent Society, as against the present two. There is a provision for increase in the publications, for abstracts from engineering articles, and for a technical staff under the direction of the Publication Committee. Probably all these things can be carried out at the present time under our present Constitution. The one important point which occurs to me is that we cannot do these things unless we have more money, and I would like to ask the Committee how it proposes to get the money. You know our annual dues are fixed by the Constitution at $15 for members outside of District No. 1 and $25 for members resident in that District. There is a move in the New York District to form a local association, and to request the Board of Direction to change the Constitution so as to make a change in the dues. In other words, the local association in the New York District proposes that its members pay for its meetings, just as the local associations in other places pay for their meetings, and that there will be no difference between resident and non-resident dues. As a suggestion, you know that the dues have not been changed for 20 years, but almost everything else has advanced to after-war prices. What would you think of raising the dues throughout the whole country to $25? The only other way that I know to get the money to carry on these activities would be possibly to go into matters more commercially in the publications; the Publication Committee has had under consideration the question of adopting advertising in order to get money to carry on our various technical activities. We do not know how the Society or the Development Committee will receive this, but I bring it before you for your consideration.

W. H. WOODBURY, M. AM. SOC. C. E.—I want to commend the Committee on its report. I think it is a magnificent move forward.

That this Committee has made such a move forward, brings to my mind a fact that we should not overlook; it is a representative Committee.

Under (g), on page 4 of the report, it speaks of having an annual conference of delegates. This Committee has perhaps done more for the advancement of our Society than any other one organization that we have had in years, and the very fact that it is composed of representatives (with a few exceptions) is proof that this is a very valuable principle of organization, and I cannot see why we should not perpetuate this principle and make a similar body the governing body. We have a Board of Direction which is too large for an executive body and too small to be representative. To my mind the quickest way to get action and representative government is by making this a feature of our organization and cutting out a large part of our unwieldy machinery. Taking the suggestion (a), "That every member of the Society be a member of a local association", combined with the idea of a representative governing body, we have the ideal method of government. Every member should belong to a local association, and the local association have a representative. These representatives would come directly from the local associations and speak for them. That would be a government which would be directly in touch with every individual member. As it is now, it is impossible for our Board of Direction to be very definitely representative, and I think that this is a feature we should have.

Another thing I want to speak of is the matter of Society publications. The question in my mind is whether or not we should increase them very greatly, and, as a matter of purely a question to be asked, I would like to throw out the following for consideration. Compare our publications with any publication that is put "on its own" and made to be self-supporting, similar to our great technical magazines that must stand the test without artificial support. Let us think of our publications in that position. What would be the result if that were to be the test? I throw this out merely as a question.

Clarence Blakeslee, M. Am. Soc. C. E.—There is one thing in this Committee report that strikes me and, that is, the opportunities offered to the young men. When I was young, I wrote a paper, but when I took it to my partner, he said: "Well, Blakeslee, they won't want it—it won't do—the Society will never take it, and I don't blame them." If, however, the Society had taken that paper at that time, it would have done me a great deal of good. So I feel that the young men in our Society ought to have a chance. In this technical work we want good papers, and I want to appeal to the Board of Direction, and our Secretary, to give the young man—the young brother—a chance. If a young member has written a paper—even if it is a little long—slip it in, and it will do him a world of good.

THE SECRETARY.—I want to say one word regarding the code of ethics. I do not think that Professor Swain touched on the real thought about the code of ethics. Whether positive or negative, the really important thing about a code of ethics is the ability to enforce it. That is what this Society has not got.

PROFESSOR SWAIN.—I thoroughly agree with Mr. Hunt. I took it that was covered by another paragraph which provided for more effective means of disciplining and expulsion. I do not know whether that was so interpreted by the Committee.

MR. HALL.—May I say just a word on some of these less important affairs, Mr. Darling, Chairman of our Sub-Committee, not being here. This question of the code of ethics has been mentioned, and with it you may note what we say about the definition of the word "engineer." What is presented to you in the report is a specification for a code of ethics, and a specification for a definition. The Committee had a number of definitions, but it had not sufficient time to analyze them and bring them before you as its last word on that subject.

As to the code of ethics, I will say that there was a positive code submitted, conforming to the specification, and, on the first reading, it was adopted unanimously by the Sub-Committee. We had, however, a great many other data, and the report was becoming entirely too long. For that reason, the code of ethics was suppressed and a specification for one substituted. I hope the membership will deal with the code of ethics with an open mind when it comes to it.

HUNTER MCDONALD, PAST-PRESIDENT, AM. SOC. C. E.—I find myself in almost entire accord with what I read in this report. I have read it rather hastily, but I am somewhat familiar with some of the things in it, and I will reserve my remarks and criticisms for some more deliberate occasion and submit them in writing to the Committee, if I find that I do not tally with it in many respects.

I want to congratulate Past-President Talbot on his wisdom in selecting this Committee, and to congratulate the Committee on its splendid work. Several members of the Committee have asked me to give them the result of my experience with a local organization in a city where no previous organization of engineers existed—which is one of the problems to be confronted in any movement looking toward the unification of the profession. Personally, I am a strong believer in the power of the local organization. I think it should have autonomy just as far as possible. I am personally very much in favor of State organizations. I think the engineers of each State ought to be in a position to interest themselves in public affairs whenever necessary, and should have an organization through which to do it. I do not believe we can attain our best success in securing public recognition by placing members of our profession only in official positions. We have to travel a long road; we have to educate public sentiment up to

the point of recognizing the necessity for engineering and engineering advice in public activities. I think our professional engineering societies have failed to recognize one very important feature, in connection with the unification of the Engineering Profession, that is, that a very large body of competent and splendid engineers are not members of any organization. There are a great many of them, and when we seek unification we must remember that these engineers must be given something to attract them, in order to bring them into the organization.

I think the way we will get recognition as a profession is by the engineers—the men who call themselves engineers and have the right to do so—associating themselves together in every community where there are ten or twelve, and assuming a position in the community which will induce the public to have confidence in them and feel that they have no axes to grind and no ulterior motives, but that they will, as far as they can in a general way, advise the public with regard to local affairs. The public does not take that kind of advice very kindly, because you cannot arouse public opinion on any matter until the people are confronted with a calamity. It is the duty of the Engineering Profession to endeavor to prepare and educate the public before the calamity occurs. I do not mean that engineers should go into detail and undertake to work out problems free of charge to the civic body or the State; but they should try to secure, in the community in which they live, and in their State, the confidence of the public to the extent that the people will at least feel that if they are taking their advice, they are going in the right direction.

I would call the attention of the Committee to the excellent methods pursued by the International Rotary Club, of which I am a member. A strong feature of its hold on its membership and the public, wherever branches are located, is the noon-day luncheon. Adopting that plan in our community two or three years ago, we became associated with the Commercial Club, not under their orders, but under the same roof. We have given that Club to understand that we are there to serve it as a body, and we have been called on many times to do so, and have done it. We have a membership of about 125, and the average attendance at luncheon is about 25. Our programme, usually consists of committee reports and discussion of non-technical matters. Once a month we have a technical paper with discussion. We have standing committees on various subjects, and we require reports from them from time to time; and if they do not report, a new committee is appointed. We feel that our organization is gradually winning the public confidence, and that we are now in a position to do much good.

I throw this out as a suggestion that may be valuable in those communities where there are no sections of the National Engineering Societies. Where sections of the National Engineering Societies already exist, I am not very familiar with the problem; but it is a

problem, and it can be solved, and your Committee must find a way to solve it. The thing we must avoid is that which has separated our churches in all the communities—the endeavor to push the propaganda of each particular organization. Our effort must be to unite them, and, in that way, to unite the Profession.

C. F. LOWETH, M. AM. SOC. C. E.—I had only a few minutes to peruse this report before coming here, and I was very well pleased with it. I congratulate the Committee on being able to put forward such an excellent report in so short a time. However, there have been some matters in connection with its discussion from the floor, which make me feel practically that the Committee in this report says one thing and that some of its members, in their minds, have another thing in view.

We have heard this afternoon—and I have heard many times in the past—the emphasis laid on the statement that the National Societies are technical societies; that they have never done anything else and are not organized so that they can do anything else, and that the welfare work, so-called, of the Engineering Profession must come from other sources. That does not seem to me to be a correct analysis. The American Society of Civil Engineers has done a great many things in the line of welfare work for engineers. The American Society of Civil Engineers adopted several years ago an admirable code of ethics. It has standing committees that have done good work, and, through the efforts of those committees, very noble work has been done in respect to engineers. Several years ago—referring to the licensing of engineers—a bill was prepared which at that time was, and perhaps is now, the best bill for licensing engineers in existence. We may not all agree that there should be licensing; but if there is to be a bill, that which this Society fathered and put forth is well worth the attention of engineers. In many other ways, this Society has stood for things, not only for the technical advantage and interest of engineers, but for their welfare. Now this Society is part and parcel of the engineering organization, an engineering organization which has been standing for a great many things that pertain to the welfare of engineers. It may be that in the past this Society and the other societies—the National Societies—have not done as much along this line as they should. We all feel at times that we are not doing what we would like to do. Every one who belongs to a club, or a church, or any organization, at times feels that perhaps the organization is not doing what it should; but we rarely go out and organize something else to accomplish what is desirable through the means at hand, and it seems to me that is what we should do here, that to the extent to which the welfare of engineers has not been taken care of by the American Society of Civil Engineers, we should change our attitude, and if necessary our Constitution, so that we can keep abreast of the times.

It seems to me that there is absolutely no occasion for us to seek out new activities, new organizations to do the things that this Society was organized to do and has done fully as well as any other organization, and which, with the prestige of its membership and the accumulation of its good work back of it, I feel it can do better than any other organization.

T. C. HATTON, M. AM. SOC. C. E.—I desire to support what Mr. Loweth has said. It seemed to me while Mr. Hunt was reading the report—I had not read it before—that the Committee proposes to give birth to a child which must be taken care of until it is strong enough to take care of itself. I have been connected with a great many associations. I am now connected with one in which the different local associations of the various National Societies and a few of the civil engineers are members. In fact, the civil engineers run the association. I think there are only about 10 or 12 members of that Society, while there are 400 or 500 members of the others. Our National Society has never done a thing for us, never suggested doing anything for us. I am also President of the State Engineers' Society. We have never had any recognition of any kind from our Parent Society, and, up to the present time, all the associations to which I have belonged—and I have been an officer of most of them—have not had any affiliation with a National Society, and I do not see that these committee reports will do us any more good. I know you have congratulated the Committee, and its members have done hard work, but right back of its report is the same old story; you can see the proof of it in this room—look at the bald heads present—we have been coming here for years. You do not see very many young men; there is not a really young man here. Why does he not come? Because we old men who have been coming here for years, do not want to be disturbed from our old ideas. It does not appeal to the young men, that attitude. Out of 54 or 55 young men in my organization, whom I have asked several times to become members of the American Society of Civil Engineers—some of them are members—many put up the question: "What is the Society going to do for me? I read your *Proceedings,* but they are far too technical for me to understand. They do not come down to bed-rock like the engineering magazines. I cannot understand them; I am not well enough educated to understand them; they do not do me any good. I get my information from the *Engineering News-Record* and other papers of that kind."

One thing in Mr. Right's remarks appealed to me. He spoke about the increase in dues. I am in hearty accord with it; to anything that is going to assist the younger men in our organization, I say "Amen".

Another thing, Mr. Blakeslee spoke about the publications: If the Publication Committee of our Society should invite the younger element of the Society to contribute to the publications, I think they

would be a great deal more interesting and bring our younger men closer to the Society than we have ever been able to bring them. If, however, you are going, with this report, to organize your local members into societies—city or district, and then State—and then let them swim or sink for themselves, it will be worse than it is now. You talk about personal service. I preach that all the time; but I want you to know that there is something besides personal service—it is Society service. We cannot be satisfied with personal service, each person must give his service to the Society too.

A. F. Blaser, M. Am. Soc. C. E.—I have an apology or two to offer for being here: First, I am not bald-headed, so I do not believe I can classify; second, I believe this is the "cold" room, and I thought we were to have a warm welcome. I should call it a hot reception, so much so that I really feel like apologizing for saying anything.

On the other hand, I feel that the Committee on Development is still here, and as we all come from various parts of the country, it seems to me that there is no better opportunity for the Committee to become acquainted with our views than now. It is for that reason only that I care to say a few words.

By what Messrs. Loweth and Hatton have said, I am reminded of a little story which will illustrate my idea: Traveling abroad, in Rome, some years ago, we ran across an American who had been all over the city, and had seen all the wonderful sights in that old civilization. Some one said to him, "How have you enjoyed them?" "Well," he said, "it is pretty fair, but do you know I have not had a good steak since I have been here in Rome?" I confess that I felt there was nothing further to discuss after that statement.

I have a great deal of sympathy for all those who feel toward the Society, as they evidently do, that it has represented and does represent a certain tradition which must be respected. I feel very strongly on that subject. We are engineers. This is an Engineering Society, and I believe in the technical definition absolutely. It is, therefore, with some hesitancy that I mention the other thing that it is necessary to mention, the fact that you must consider the welfare of the younger engineers whether you wish to or not. If this Society is going to prosper and succeed, it must be done—with all due respect to the older men. And with all their love for the Engineering Society—the American Society of Civil Engineers—I think they will have to face this other issue also. I have come rather slowly to Minneapolis, from Cleveland, stopping in several places. I called on a man who had charge of a very important piece of work, and there were a number of negroes on the job, whose pay was the same as his. He said that on a certain night he had had charge of a gang of men on important work, all that night and next day, on the time basis, and each man under him had drawn $15 pay, while he had drawn $7.

Now, I do not like to mention these things, but I do believe it indicates something which we have to recognize. I am immensely pleased that a good portion of this report is devoted to welfare work. I believe that those who read the signs of the times must recognize that the world is not quite as it used to be, whether we wish it or not, for the simple reason that there are other organizations (and I am not referring particularly to engineering organizations), but there are other organizations in the world, which are looking out primarily for the welfare of its members, and we must recognize that there is a lack which should be overcome. I have had many men speak to me about this. They say, "We do not like to do this, but what can we do?" I merely mention that subject in order to give what my experience would dictate. I wish to congratulate the Committee on emphasizing that feature of the work.

J. A. Ockerson, Past-President, Am. Soc. C. E.—I want to say that there is one thing we should try to overcome, and that is the indifference among the majority of members of this Society about voting. Ask the members to express an opinion or vote on any subject, no matter how important, and you will get about one-third of them to reply. That is something we should take into consideration when we start out on this propaganda, and that is what we ought to eliminate.

As to the young man who asks, "What can you do for me?" He should realize that he has something to do for the Society. He is apt to forget that.

Tributary to our Local Association in St. Louis, we have normally more than 200 members; that is, we have about 60 who pay a small fee for membership. If the Parent Society should conclude to allow each local association a certain sum for carrying on its business, that might help; we have tried in various ways to get local members to join our local association, but with indifferent success. Perhaps the Development Committee can find some practicable method of listing all members within a given district as members of a local association.

We had a meeting recently, and something came up from which it appeared that the Local Association would take a step that the National Society had not authorized. It was suggested that our Constitution, approved by the Parent Society, did not allow us to do that, and one member responded, "The quicker we cut loose from it, the better." That is another phase to be considered. How far can the Society properly control the actions of the local associations? I mention these few practical points which have occurred to me as these talks have been made.

A Member.—I want to say that I am heartily in favor of the plan proposed by the Committee, but the question arises, How will you perfect it? Will you leave it to a development committee scattered all over the country, and composed of men busy with other duties?

It seems to me that the time is now ripe for engineers to get together and plan something to perfect this re-organization. That means a vast amount of work, which you can hardly expect to have performed voluntarily. I suggest that the Society take the lead and that the other National Societies be asked to come in and raise sufficient funds to put this re-organization into effect, and that a sufficient amount be raised afterward to carry on the work of the organization. It seems to me we ought to take steps at once to raise at least $1 000 per annum, to carry on this work. It will be necessary that the local associations be made to aid in doing this. If it is left entirely to voluntary effort, it will take several years to accomplish. So I want to suggest now that we raise the funds and that the Society take this up at this time.

G. C. Mason, M. Am. Soc. C. E.—There is one point in connection with this report that has not been thoroughly brought out, that is, the fact that this Committee has done a great deal more work than is indicated in the report. The report has been made as brief as possible, touching only the fundamentals, and I doubt if the last speaker is familiar with the extent to which many of the details have been worked out.

As to the matter of increasing the dues, I believe I am correct in saying that such an increase is a matter of secondary consideration. A member is not asking whether our dues are $15 or $25. He is asking, Am I getting value received? If the Society gives him $25 worth, he is perfectly willing to pay that sum.

Charles Hansel, M. Am. Soc. C. E.—I believe that we as engineers take a great deal too much credit for our accomplishments. I think we talk too much about it. I do not hope to get others to agree with us, to be obsessed in the same way, until each of us takes not only an active part but an actual part in the civic work of the community. From time to time we have been asked to take an active part, which we should do, not as engineers, but to associate ourselves actively with civic bodies as citizens of the United States, forgetting all the time that one is an engineer, if he can, and going in and doing his share as a citizen.

I shall hope that all of you will agree with Item 8 on page 7 of the report, that that should be the sentiment of this Convention and should be uttered to the world. It is a duty proudly to be achieved. You have heard a great deal of what is due us, but not so much about what is due from us to other people. I have gotten into this civic work, and I find that I have been an awful slacker. I believe that any one who has gotten into it, will find that he has been a slacker; and so I have been obsessed, through all these Committee meetings, with the feeling that somehow or other we should get our Society to say to the world that we have found our obligation and are now pre-

pared to undertake to discharge that duty; and I shall hope that this Convention will send out to the world the sentiment, if not the phraseology, contained in Item 8, in the drafting of which I confess I had a hand. Change it if you will, as to the wording, but do not take out the urgent call that each engineer shall join the civic association of his community.

GEORGE G. ANDERSON, M. AM. SOC. C. E.—Gentlemen, Members of the American Society: Being a member of the Committee on Development, I do not feel that I should say very much at this time. I think the members of the Committee are here in a receptive attitude; we have submitted a report, to be presented at this business meeting. In the preparation of that report, we have more or less unconsciously listened to expressions of the members of the Society on the subjects before us, and we desire at all times to get as many as possible of those expressions.

There are, however, one or two points I want to refer to, to elucidate some questions which have been raised.

I think it is fitting for myself, and in that I may speak for the members of the Committee, to say that we are very grateful for the kind remarks that have been made about this report. I think we have unburdened ourselves at this time. Personally, I am not altogether satisfied with it, and I am very pleased to find that others have a better opinion of it than I myself have. I accepted appointment on this Committee in the spirit Mr. Nethercut has mentioned—that of service—as I am sure all the members of the Committee did. I had been thinking along this line for a number of years, and I was particularly impressed with one portion of the resolution creating the Committee, that the "sociological and economic conditions are in a state of flux and are leading to new alignments of the elements of society." I think that was the crux of the situation and that that was the impression conveyed to the Committee on Development. I said, at the first meeting in Chicago, that I had approached the whole question with an entirely open mind. I am still of an open mind, and I think every member of this Committee is of an open mind, although more or less committed to the principles of this report; we are of an open mind on the subject of the grave changes which must be considered by this Society, whether we like them or not, and which must be considered and acted on by the Profession at large.

Personally, I am entirely in sympathy with the view that any change we may bring about must be based on what Mr. Blaser has referred to as the recognition and understanding of the needs and the wants of the younger members of the Profession; and I think the whole report which has been submitted for your consideration, is based on that fundamental idea, first, on the individual member, and, particularly, the younger members of the Society or the Profession, and

then on the method by which he can get together with others, and that is through the local associations. It is just in expansion, perhaps, or illumination of what some of the local associations in some sections of the country have done in that respect, that I want to touch on, and particularly in their aspect to the question that Professor Swain referred to, that is, the question of license. I am in accord with Professor Swain, to some extent, when he says that he is opposed to the principle of license. I think we must recognize that the Profession is divided on that question; but whether we are divided or not, we have to meet that question as a practical question, and it is the duty of this Society and of the combined Engineering Profession to meet it intelligently, and, if I may say so, intellectually. It is not a local question. It is a matter for consideration everywhere; it has been or is before legislative bodies in New York, Indiana, Florida, Idaho, Oregon, California, and elsewhere. It is true that a joint committee in 1915 drafted a license law, and it is also true that nothing whatever was ever done with that draft. I think that is correct? Now, whether or not the question of licensing is desirable, from the point of view of the individual members of the Profession, licensing is coming; it is inevitable, and I believe, and have contended for nine years, that this Society should get ready to meet the inevitable. What is the result so far? What about the licensing laws in the various States? They all differ in some degree. I think it may be said, with fairness and justice, that the older men are handicapped by these laws; that injustice is done to the older practitioners, and, in many instances, to the younger ones, because of the complexity of the laws. There is one State which has a law that may be administered in such a way that any of you gentlemen going there, from other States, would find the doors barred against you absolutely; there is no way to get around it. What is happening elsewhere? In California, this year, acting for good and sufficient reasons, the engineers in one section introduced a bill to counteract the effects of a law threatened by other associations; the joint engineering societies of San Francisco met and considered it, and as such joint society approved the bill unanimously and put it into the Legislature with the recommendation that it be passed. The bill was sent south to be considered by the Profession of the southern part of the State, and the Southern associations unanimously disapproved of the same bill which the Northern associations had unanimously approved. The Profession was up against an *impassé*, an intolerable one in my judgment, because it seemed to me to be undesirable to appear before the Legislature with an admission that the Profession of Engineering was widely divided, in a division which was apparently unbridgeable. What was the result? In Los Angeles, there is a joint technical society consisting of seven member organizations, and I will touch later on some of the details of that organization,

to illustrate some of Mr. McDonald's remarks. Out of the consideration of the license bill in San Francisco, a joint technical society was there created, consisting of five member organizations. These two technical organizations got together in discussion of this bill and agreed on its withdrawal and the obliteration of the differences between the two sections, and the creation of a State organization has resulted for the purpose of considering legislation itself, of presenting legislation that is desirable, and of opposing legislation that is undesirable.

That is exactly the basis of the proposition for a State and National council submitted to you in this report. I am sure that all the members of the Committee on Development feel as I do, that, somehow or other, this proposal can be worked out on that basis. We do not contend that the machinery we have outlined—not in detail—is just what we want; we, therefore, invite your opinions, your criticisms, and your suggestions, and we feel that we must act together, in order to take care of what may be said to be the most important subject in the report.

As to the suggestion of Mr. McDonald: There is in Los Angeles, among this body of joint technical societies of seven, a local society, the oldest in the city, and that local association is incorporated with the seven. That society includes members—engineers—who could not otherwise be got into any National Society, but who ought to have a voice and representation and consideration in any non-technical work that is to be done by the combined societies or professions; and I think that answers very largely what is in Mr. McDonald's mind, as he has evidenced by his own experience.

Some other questions asked here very properly raised the question of the necessary dues to work out all this programme. I will not discuss that subject at length at this time, but I do endorse the general proposition that if and when the Society, either as a unit or as an aggregation of societies, will "put over the goods" and will deliver to the young men of the Profession, and to all of us, more than we are getting to-day, there will be no difficulty about getting the dues necessary to carry out the work. Of that, I am personally satisfied in my more or less constant consideration of this question with the younger members of the Profession.

In Los Angeles, at one time, there was some difficulty with the Local Association of the Society. The membership had fallen off, and we very properly concluded that it was due to the fact that a great many of the members were living at points not particularly accessible to Los Angeles as a center; it meant some effort and some sacrifice to attend the meetings. At the beginning of 1919, we instituted a system of holding monthly meetings for the presentation and discussion of technical papers, and I will say here, that I think the character of those papers is such as to be worthy of presentation to and acceptance by the Parent Society, and I have no doubt they will be so accepted. We

published bulletins containing abstracts of the papers, and we have increased our membership 25% in the last three months. I think I conclude rightly that it is an evidence of the desire of the membership, to get something, and of the members' readiness to "come through", if they do get it.

I am quite sure that I can say for all the members of the Committee on Development, that we are very grateful for your appreciation. We have worked hard, and we are glad to have you think that we are on the right track and that we are doing what we can. We have worked hard and we propose to continue to work hard, but we do want to know now how the membership feels, to guide us and help us in our deliberations and conclusions.

O. H. DICKERSON, M. AM. SOC. C. E.—One of the ancient philosophers represented the gods as enjoying themselves on the top of Mount Olympus, busy with their own pursuits and utterly indifferent to the sufferings of humanity below. I have wondered sometimes if a great many of the engineers who are members of our National Societies, as well as many who are not, do not look on those national societies as those philosophers did upon the gods. It seems to me that the proper effort has not been made by our societies to get all qualified engineers into them. I think there can be no satisfactory solution of this question until every man who has qualified as an engineer is a member of an engineering organization; until the Profession is a unit; until we can express our opinion and command the attention of the people we want to hear us.

Professor Swain mentioned the code of ethics suggested by the Development Committee, and seemed to fear it would be difficult to devise a positive code of ethics which should be brief. Of the two codes of ethics that hold a prominent place in our civilization—one is largely negative and is quite long, and the other is positive and very short. So I think it is possible to work out that question.

Another thing, twenty-one years ago this month I left the engineering school, having completed my course, and entered what I fondly hoped was going to be a Profession. They never told me it was a profession at the engineering school. We did a great many things pretty thoroughly, and learned a good deal, of course, but we were never given any instruction whatever about our duties as professional men. Though students of law and medicine have developed in them a keen professional consciousness, I believe our Profession has never taken the position it should as to the engineering students in the engineering schools of this country. I believe that the engineering societies should see to it that students are taught from the beginning that they are to be professional men, until there is developed a professional conscience among all the engineers of the country. That is what we will have to work for if we want any plan of development to

be effective in advancing the standing of our Profession to the position relative to the other professions that we ought to occupy.

THE PRESIDENT.—Gentlemen, I notice that quite a number of members have left. I do not know whether it is on account of the heat, or what; but this is a very interesting subject, and I think every one ought to have an opportunity to give any information which will help the Development Committee. As no one else cares to say anything, I will ask Professor Talbot if he will say something in closing the discussion for the afternoon.

A. N. TALBOT, PAST-PRESIDENT, AM. SOC. C. E.—I do not know that I can say much on this subject at this time. When I was elected President of the Society, and looked further into its work, it seemed to me that it would be worth while to inquire into the field of its work and learn whether we were fulfilling all the duties and responsibilities which should be undertaken by such a society. Among the matters that came to my mind was one which has been mentioned several times this afternoon, our relation to the younger man, giving him service and getting him to give service. As time went on, it seemed to me that a committee should be appointed for the consideration of all such matters. The time was not propitious; in fact, many discouraged attempting anything until after the war. It seemed almost to approach disloyalty to engage in activities other than carrying on the war. At the June, 1918, meeting of the Board of Direction, however, a resolution was presented, calling for the appointment of a Committee on Development. Its value was greatly increased through the very excellent elucidation of its purpose, as expressed in a preamble drafted by a committee which I think should have credit for it—Messrs. J. W. Alvord, A. D. Flinn, and A. M. Hunt. The resolution was promptly passed by the Board of Direction. It took some time, of course, to get the work started. I have kept in touch, in a way, with the work of the Committee since that time. I attended the meeting in Chicago in November, and I know the spirit of the Committee in the work. I am much pleased with the form of the report presented here to-day. As stated by Mr. Mason, the Committee has a large amount of material which the several sub-committees have gathered and worked up; it seemed best not to present that, but to give in terse form the fundamentals of the problem as the Committee saw it, to put before the membership the matters which the Committee feels should be considered, in order that there may be discussion, and that the opinions of the membership may be learned. The very topics given in the report indicate things of importance to the Society, to its members, and to its work—the matter of Local Associations, the relations of State and National organizations doing the especial kinds of work, something for the younger men of the Profession, personal service, technical activities, publicity, services of the engineer to the community, State and nation.

I trust that the discussion this afternoon will not be the end of such discussion. I am very hopeful that when this report is sent out to the membership of the Society, and especially when it is discussed at the meetings of the Local Associations of members all over the country, there will be a very full and thorough discussion and that the members will send in their views to the Committee so that the Committee may have the benefit of them in preparing a further report.

I wish to call attention at this time to the statement made by Maj. Williams concerning the Committee's methods of work, that it is its plan eventually to send out to the membership a series of questions, in order to get the views and vote of the Society on these various matters; because it would be of little use to make a report and then have a committee prepare amendments to the Constitution, or a new Constitution, when a vote would show that the membership of the Society does not believe in doing that thing at that time. We must, it seems to me, know the sentiments of the Society, and then prepare a document to carry out its wishes; and it is to be hoped that a plan made after a vote is taken will be adopted and carried out. I am very hopeful that the work of the Committee will result in great advantage to the Society and to its membership.

THE PRESIDENT.—It is not my desire to cut off the discussion in connection with this matter, but I do not understand that any one else cares to discuss the Committee's report. The Secretary has something to say, and we will listen to him now.

THE SECRETARY.—Mr. President, I have the following letter from the Secretary of the Engineering Institute of Canada, which I will read:

"MONTREAL, May 23d, 1919.

"DR. CHAS. WARREN HUNT,
"Secretary, American Society of Civil Engineers,
"33 West Thirty-ninth Street,
"New York City, N. Y.

"DEAR DOCTOR HUNT:—It was a pleasure to receive your letter of May 20th kindly extending an invitation to be present at your coming summer meeting at St. Paul, together with one of the officers of the Institute.

"Brig.-Gen. Sir Alex. Bertram, member of Council, has kindly consented to visit the western branches with me during the summer, and on consultation with him regarding visiting St. Paul at a time to include part of your summer meeting, he stated that it would give him much pleasure to do so and I wish to express the same sentiments.

"We have accordingly arranged our schedule to arrive in St. Paul on the evening of June 16th, with the expectation of being with you for at least two days of your meeting, namely, the 17th and 18th. I am forwarding copy of your letter to President Lieut. Col. R. W. Leonard, who resides at St. Catharines, in the hope that he might also find it possible to be present.

"Sir Alexander was Chairman of the Shell Committee in Canada which initiated the manufacture of munitions in this country and did such excellent work in that connection.

"Looking forward with pleasure to seeing you at your summer meeting and thanking you for your courteous invitation to be present, I remain

"Yours sincerely,

"FRASER S. KEITH,
"Secretary."

In connection with this matter, I have just received the following telegram:

"CHICAGO, ILLS., 3:10 P. M., June 17, 1919.
"CHARLES WARREN HUNT,
"Radisson Hotel, Mpls., Minn.

"General Bertram cannot attend convention, arriving Wednesday morning.

"FRASER S. KEITH."

THE PRESIDENT.—There seems to be nothing else, and a motion to adjourn is in order.

(Motion duly made, seconded, and carried.)

Adjourned.

FORTY-NINTH ANNUAL CONVENTION

EXCURSIONS AND ENTERTAINMENTS

The arrangements for the Convention were in the hands of the following Committees:

Committee of Arrangements of the Board of Direction

W. L. Darling, *Chairman,*

E. E. Wall — Chas. Warren Hunt

Local Committee

R. D. Thomas, *Chairman,*

W. C. Armstrong
F. H. Bass
R. B. C. Bement
F. W. Cappelen
Oscar Claussen
William de la Barre
F. E. House
W. H. Hoyt
W. N. Jones
F. C. Shenehon
Horace E. Stevens
Howard E. Stevens
P. E. Thian
W. T. Walker
George L. Wilson
L. P. Wolff

Ladies' Theatre Party

Tuesday, June 17th, 1919.—1.15 P. M.—The visiting ladies were the guests of the Ladies' General Committee at a theatre party in St. Paul. The party was greatly enjoyed and was attended by about 40 ladies.

Reception

Tuesday, June 17th.—9 P. M.—A reception tendered by the Local Membership, and attended by about 175 members and guests, was held in the Gold Room of the Radisson Hotel. Dancing was enjoyed.

Automobile Drive Around the "Twin Cities"

Wednesday, June 18th.—The day was devoted to an automobile drive of 33 miles around the "Twin Cities", the itinerary of which had been admirably planned by the Local Committee so that all points of interest were shown to the visitors. The automobiles, furnished through the courtesy of the Local Membership, left the Radisson Hotel at 10 A. M., touring Minneapolis, and arriving at the St. Paul Hotel, St. Paul, for luncheon at 12.30 P. M. The trip was continued about St. Paul, ending at the St. Paul Town and Country Club, where the party was entertained at a dinner dance by the St. Paul Engineers' Society. The affair was a most enjoyable one and was attended by about 200 members and guests. Before reaching the St. Paul Town and Country Club, a stop was made, by invitation, at "Stone Bridge", the residence of Mr. Oliver Crosby, where the party was most hospitably entertained by Mr. and Mrs. Crosby.

Excursion to Lake Minnetonka

Thursday, June 19th.—The day was devoted to an excursion by trolley to Lake Minnetonka, about fifteen miles distant from Minneapolis, and included a delightful two-hour sail on the lake, the party reaching the Lafayette Club in time for luncheon, after which there was dancing. In the afternoon, a Golf Tournament was held on the links of the Lafayette Club, for which prizes were offered by the Local Committee. The party, consisting of about 118 persons, returned to Minneapolis, *via* the Great Northern Railway, in time for dinner.

Smoker

Thursday, June 19th.—8.30 P. M.—A lecture, illustrated by lantern slides and motion pictures, was given in the Gold Room of the Radisson Hotel, by Lieut.-Col. F. W. Scheidenhelm, M. Am. Soc. C. E., Corps of Engineers, U. S. A., on "The Work of Army Troops of the American First Army in France." After the lecture, an informal farewell "Smoker" was tendered the members and their guests by the Minneapolis Engineers' Club, on the roof garden of the hotel, to which the ladies of the party were also invited. There was dancing and light refreshments were served. The evening was a great success, the attendance being about 150.

Excursions to Manufacturing Plants, etc.

Friday, June 20th.—The morning, which had been left free, was spent by the members and guests in visits to manufacturing and industrial plants, flour mills, etc., and other points of engineering interest, under the charge of the Local Committee.

Excursion to Duluth, Minn., and the Missabe Iron Range

Friday, June 20th.—About 125 members and guests, left Minneapolis by special train at 1.30 P. M., *via* the Northern Pacific Railroad, and arrived at Duluth at 7 P. M., dinner having been served on the train. The evening was spent on a trip by steamer around the Duluth-Superior Harbor, as guests of the Duluth Association of Members of the American Society of Civil Engineers and the Duluth Engineers' Club, and was greatly enjoyed. There was dancing on the boat.

Saturday, June 21st.—After a night run from Duluth, over the Duluth, Missabe, and Northern Railway, the special train arrived at Hibbing at 9 A. M., where the party, as guests of the Engineers' Club of Northern Minnesota, was taken, on flat cars, through the Hull-Rust-Mahoning Open-Pit Mines. After luncheon at the Oliver Club, the visitors motored 30 miles along the Iron Range to Eveleth, obtaining a splendid view of the Missabe open-pit mines and their development, including the operation of the largest steam shovels in the world.

At Eveleth the special train was again taken over the Duluth and Iron Range Railroad to the ore-shipping port of Two Harbors, where the visitors were given an opportunity to inspect the ore docks from which the shipments of ore from the Missabe Range are made. At 8 P. M., the party left Two Harbors for the return trip to Duluth, which was reached at 9 P. M. After a stop of three hours at Duluth, during which the party was pleasantly entertained by the Duluth Association of Members by an automobile trip around Duluth and by a dance at the Kitchi Gammi Club, the return was made by the special train, which arrived at St. Paul and Minneapolis early on the morning of Sunday, June 22d, thus allowing the visitors ample time to catch morning trains east or west. This trip was most enjoyable, and the party was delightfully entertained by the Local Membership at every point visited.

Attendance

The following 149 Members were in attendance. There were also present 135 ladies and guests of the members.

Allee, O. P.....Kansas City, Mo.
Allen, R. L.....Syracuse, N. Y.
Alvord, J. W.....Chicago, Ill.
Anderson, G. G..Los Angeles, Cal.
Annan, C. L.....St. Paul, Minn.
Armstrong, W. C..St. Paul, Minn.
Bass, Frederic.Minneapolis, Minn.
Bates, Onward.....Chicago, Ill.
Bensel, J. A.....New York City
Blakeslee, Clarence, New Haven, Conn.
Blaser, A. F.....Cleveland, Ohio
Bowen, O. S.....Seattle, Wash.
Boynton, G. H...Muscatine, Iowa
Brace, J. H.....New York City
Briggs, E. G.....St. Paul, Minn.
Brillhart, J. H.....Dallas, Tex.
Bruntlett, E. H..Blue Island, Ill.
Buehler, Walter.....Chicago, Ill.
Cappelen, F. W., Minneapolis, Minn.
Carey, W. N.....St. Paul, Minn.
Chandler, E. F., University, N. Dak.
Childs, J. A.....St. Paul, Minn.
Claar, R. S....Minneapolis, Minn.
Clark, W. A.....Duluth, Minn.
Claussen, Oscar...St. Paul, Minn.
Clements, M. F....St. Paul, Minn.
Connor, E. H..Leavenworth, Kans.
Conway, J. S...Washington, D. C.
Cowin, James..Minneapolis, Minn.
Cowles, W. P..Minneapolis, Minn.
Crocker, H. S....Brooklyn, N. Y.
Cummings, R. A..Pittsburgh, Pa.
Currie, C. H...Webster City, Iowa
Curtis, F. S.....Boston, Mass.
Cutler, A. S...Minneapolis, Minn.
Daniels, Arthur, Minneapolis, Minn.
Darling, J. H.....Duluth, Minn.
Darling, W. L....St. Paul, Minn.
de la Barre, William, Minneapolis, Minn.
Dickerson, O. H...Duluth, Minn.
Doten, L. S...Washington, D. C.
Elmer, H. N.....Chicago, Ill.
Elwell, C. C...New Haven, Conn.
Farnham, Robert, Philadelphia, Pa.
Felton, H. C.....Camden, N. J.

Flinn, A. D.....New York City
Frick, O. H.....Milwaukee, Wis.

Gates, C. L.....Toledo, Ohio
Gauger, P. C.....St. Paul, Minn.
Gillette, L. S..Minneapolis, Minn.
Gilman, J. B..Minneapolis, Minn.
Goodwin, W. R.,
Minneapolis, Minn.
Green, H. R..Cedar Rapids, Iowa
Grunsky, C. E., San Francisco, Cal.

Haberle, E. L..Minneapolis, Minn.
Hadwen, T. L. D....Chicago, Ill.
Haehl, H. L..San Francisco, Cal.
Hall, J. L.....Seattle, Wash.
Hallsted, J. C.....Chicago, Ill.
Hamlin, Ralph.Minneapolis, Minn.
Hansel, Charles..New York City
Hatton, T. C....Milwaukee, Wis.
Haupt, Edward.....Chicago, Ill.
Hawgood, Harry, Los Angeles, Cal.
Herrold, G. H....St. Paul, Minn.
Hogeland, A. H..St. Paul, Minn.
Honens, F. W.....Sterling, Ill.
Houston, W. O....Jackson, Mich.
Howson, E. T.....Chicago, Ill.
Humphrey, R. L..Philadelphia, Pa.
Hunt, Chas. Warren,
New York City
Hustad, A. P..Minneapolis, Minn.
Hutchinson, G. H..St. Paul, Minn.

Jensen, J. A..Minneapolis, Minn.
Jones, H. W..Minneapolis, Minn.
Jones, W. N..Minneapolis, Minn.

Ketchum, M. S....Boulder, Colo.

Loida, J. L.....St. Louis, Mo.
Lovering, H. D....St. Paul, Minn.
Loweth, C. F.....Chicago, Ill.

McDonald, Hunter,
Nashville, Tenn.
McDonald, W. F., Milwaukee, Wis.
McGrew, A. B....Pittsburgh, Pa.
Mason, G. C.....Portland, Ore.
Mehren, E. J.....New York City
Metcalf, Leonard...Boston, Mass.
Meyer, A. F..Minneapolis, Minn.
Molitor, F. A.....New York City
Morse, C. A.....Chicago, Ill.

Nethercut, E. S.....Chicago, Ill.
Newton, R. E....Milwaukee, Wis.

Oakes, L. S...Minneapolis, Minn.
Ockerson, J. A.....St. Louis, Mo.

Patton, W. B.....Duluth, Minn.
Pegram, G. H....New York City
Pillsbury, C. L.Minneapolis, Minn.
Powrie, W. R.....St. Paul, Minn.
Prince, G. T.....Omaha, Nebr.
Pruett, G. C....Miles City, Mont.

Ralston, J. C.....Spokane, Wash.
Riggs, M. J.....Toledo, Ohio
Rights, L. D.....New York City
Rogers, E. H..West Newton, Mass.

Scales, G. C..Minneapolis, Minn.
Scheidenhelm, F. W.,
New York City
Senior, F. S.....New York City
Shenehon, F. C.,
Minneapolis, Minn.
Sloan, S. A.....Philadelphia, Pa.
Smith, C. U.....Chicago, Ill.
Smith, R. L.....St. Paul, Minn.
Sprague, N. S....Pittsburgh, Pa.
Stearns, F. P.....Boston, Mass.
Stevens, Horace E..St. Paul, Minn.
Stevens, Howard E.,
St. Paul, Minn.
Strickler, G. B..Washington, D. C.
Stuart F. L.....New York City
Stuart, J. T.....Philadelphia, Pa.
Swain, G. F.....Boston, Mass.

Talbot, A. N.....Urbana, Ill.
Talbot, K. H.....Milwaukee, Wis.
Tatum, R. L.....La Grange, Ill.
Taylor, C. F.....New York City
Thian, P. E.....St. Paul, Minn.
Thomas, R. D..Minneapolis, Minn.
Tinkham, S. E.....Boston, Mass.
Trout, C. E.....New York City
Turner, C. A. P.,
Minneapolis, Minn.
Tuttle, A. S.....New York City

Vogdes, J. J....Philadelphia, Pa.

Wachter, C. L., Minneapolis, Minn.
Wagner, S. T...Philadelphia, Pa.
Walker, J. W...Philadelphia, Pa.
Walker, W. T.Minneapolis, Minn.
Warren, G. E.....Chicago, Ill.
Washburn, D. C..Elk River, Minn.
Weymouth, F. E....Denver, Colo.
Wheeler, W. H.,
Minneapolis, Minn.
Wilbanks, J. R...Columbus, Ohio
Willard, E. V....St. Paul, Minn.
Williams, F. P.....Albany, N. Y.
Williams, G. M., Washington, D. C.
Williams, G. S..Ann Arbor, Mich.
Wilson, G. L..Minneapolis, Minn.
Wolff, L. P.....St. Paul, Minn.
Woodbury, W. H..Duluth, Minn.
Woodward, S. M..Iowa City, Iowa

Yates, J. J.....New York City
Young, R. C....Marquette, Mich.

ENGINEERING ACTIVITIES OF THE TWIN CITIES

ADDRESS BY F. C. SHENEHON, M. AM. SOC. C. E., AT THE FORTY-NINTH ANNUAL CONVENTION OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, JUNE 17TH, 1919.

It has become customary to include, as a part of the programme of the Annual Convention, an address by a member of the Society resident in the region where the Convention assembles. On the part of the Administration and the visiting members the conferring of this privilege of address is a fine courtesy bestowed on the locality, and the particular local member chosen to voice the home sentiments must not be outdone by the Administration. Let me assure you at once, therefore, that I shall do you the supreme courtesy of being brief. The rarity of a June day must not be imperiled by a lengthy discourse.

The home address would be delivered more appropriately by our distinguished fellow member, Mr. William de la Barre, Chief Engineer of the St. Anthony Falls Water Power Company, who could speak with the high authority of his long service here and his more intimate knowledge of local engineering and industrial evolution. He has watched the development of engineering projects here with the same paternal and understanding interest which a father bestows on the unfolding of the potentialities of his children. Doubt as to his ability to take part in the business of this Convention, arising through illness in his household, compelled Mr. de la Barre to deny himself the privilege of formally addressing you.

My subject, as set down in the programme, is "Engineering Activities of the Twin Cities". In interpreting this subject, it will be assumed that the Twin Cities are simply the hub of a radiating series of engineering activities that follow transportation lines southward to the Gulf of Mexico, reach northward to the Lake of the Woods, and, loosely defined, eastward and westward to the Gulf of St. Lawrence and the Red River of the North. You will observe that the engineering activities of the Twin Cities are far-flung!

As I proceed to develop my theme, Sherlock Holmes might discover that my interests and convictions are hydraulic, because Water, whether I will it or not, recurs and resounds like the burden of an opera.

The early voyageurs, Radisson and Groseilliers, who penetrated the wilderness and reached the prairies of Minnesota, and the Mississippi River in the vicinity of Winona, some miles south of St. Paul, started their pioneering journey at Montreal, proceeded by canoe up the Ottawa River to Georgian Bay, Lake Huron, thence to the inlets along the west shore of Lake Michigan, and, finally, made an overland journey of 150 miles westward to the Mississippi. This was about the middle of the 17th Century. These voyageurs prepared no maps of this

region. Joliet, in 1673, reached the Mississippi by way of Lake Michigan and the Illinois River, and opened a water avenue from the south for French exploration of Minnesota. Almost exactly 240 years ago, at this time of year, Sieur Duluth landed in the vicinity of the present City of Duluth, and penetrated the inland country of Minnesota to Mille Lacs about 70 miles from Minneapolis—the first white man to report and record his explorations. Later, Father Louis Hennepin (in the summer of 1680) came to St. Paul, and went on to the cataract, to which he gave the name of his patron saint, Anthony of Padua. The Dakota Indian name for St. Anthony Falls was "Minni-i-ha-ha"—the rushing water—a name now transferred to the smaller Falls immortalized by Longfellow, "Minnehaha"—laughing water.

These pioneers were Exploration Engineers, and their activities have had to do with present engineering activities in the Twin Cities—and they reached here by water transportation in birch-bark canoes. The motives of these exploration engineers, engaged in a reconnaissance survey for the advance of civilization across a continent, were mixed. The inculcation of religion in pagan souls, the extension of imperial domains, fur trading, adventure, and the search for a westerly passage from France to China—all had a part. The naming of the St. Lawrence Rapids at Montreal, Lachine Rapids—or the Chinese Rapids—illustrates the geographical misapprehension as to the nearness of the Orient, which was actually more than 8 000 miles toward the sunset. It is said of Nicollet: "So confident was he of reaching China that he took with him a gorgeous mandarin's robe of damask to wear at his court reception."

This Minnesota country, penetrated by these exploration engineers, was inhabited by savage peoples—Indians—whose chief engineering activities were military—eternal warfare. They subsisted by hunting and fishing perhaps more substantially than by agriculture. Wild rice grew in marginal shallows of the lakes and rivers, wild fowl fed on the wild rice; moose came to the water, as cattle do, to drink, keep cool, and avoid fly pests; fish abounded; the streams were avenues of transportation—hence, aboriginal populations kept close to the waterways.

It is rather astonishing how this dependence on lakes and streams is reflected in Indian names which now exist as geographical permanencies. Minnesota means blue or misty water. The name was first applied to the Minnesota River and then taken over by the State. Missouri is Dakota for turbid water. Mississippi is Algonquin for far-reaching waters. Minnetonka means great water. Minneapolis is a half-breed name; Indian mother, "Minne", waters, Greek father, "polis", city—hence, the City of Waters. These recurring Indian names, and the French names, Radisson, Hennepin, Nicollet, La Salle, Joliet, Frontenac, and Duluth, still keep vivid the color of two cen-

turies in which the picturesque glories of French civilization met, by forest and prairie, the ancient, unprogressive, but picturesque, savagery.

My conception of a Civil Engineer is that he is a surgeon operating on the earth as his patient; and, in developing my subject, it appears desirable to touch very lightly, and very briefly, on an activity, essentially engineering, which preceded the Indian and the French in this region. The Panama Canal in some form might have been cut ages ago by geologic action, without the guiding hand of the engineer as we know him; and this surgical operation successfully completed at Panama has done a thing which we find in other places already done for us by sure, slow, constructive, geologic forces directed by the Engineer of the Universe. The problems which engineers deal with to-day, are inextricably and fundamentally dependent on natural evolutions and physical changes of the past. We take up the task at the point to which Nature has already brought it, and accelerate, retard, or modify the project. We are in partnership with every elemental, physical force of the universe, and each one of us likes to think of himself as the dominant senior partner.

Geological agencies conferred on Minnesota vast stores of hematite —the blood-red iron ore. Perhaps an account of the genesis of this deposit—the succession of events resulting in making it accessible and commercially worth while—will be of interest, particularly to those who are to visit the Iron Range. About 4½% of the crust of the earth is iron; and every stream entering the ocean carries to this omnibus catchment basin a small contribution of this metal. It gradually precipitates in the deep sea bottom, securing oxygen and carbon in part from animal and vegetable organisms, until after countless æons great beds of ore are laid down. Then, as the earth cools, State-wide slabs of crust are reared above the sea level. A glacier scrapes off and truncates this pyramidal mass. Now, this hematite, as it came out of the sea was not commercial ore, it was only about 30% iron; but, exposed to the elements, it weathers. The oxygen and carbon in part disappear, while all the iron remains, until enrichment is complete, and the ore is commercially good, with 50% or more of iron.

The geological formations exposed in the Mississippi River Gorge are interesting in their genesis, and tremendously important to the Twin Cities as bearing on present engineering activities. Down underneath is the St. Peter sandstone several hundred feet in thickness. This is made up of fine, rounded grains of white sand imperfectly cemented with porcelain clay. This sandstone is so soft that you can carve your initials in it with your finger-nail. It is porous and contains in part the artesian reservoir of water. On top of the sandstone are 4 ft. of blue shale, and, above this, about 30 ft. of limestone; then, on top, glacial drift—about 30 to 40 ft. of a mixture of sand, gravel, boulders, and clay. The sand was deposited ages ago in the sea, near shore in shallow water; then the bottom of the sea subsided, and in the

deeper water the finer sediment, mud with some lime and some organic life, formed shale; the bottom of the sea was then further depressed, and, in the deep sea, far from off-shore sedimentary deposits, the pure hard limestone formed, imprisoning in its solidifying grip the organic dead. Then the ice sheet, a mile thick over this region, melted, and left the rock débris which we call glacial drift.

The significance of these geological formations is shown by the recession of the Falls of St. Anthony from somewhere down in Iowa to its present location in Minneapolis. The destructive force of the falling water successively cut out the soft sandstone, undermining the limestone ledge, toppling it down, and permitting the persistent northward travel of the Falls, with the ever-lengthening gorge. If civilization and engineers had been in Minnesota some thousands of years ago, the water power might have been caught and held at St. Paul, and there would have then been no Minneapolis! Minneapolis itself nearly lost the water power by northward recession of the Falls some forty odd years ago; but engineers terminated the freedom of geologic action, built a great cut-off wall of concrete to protect the sandstone, and directed the flood-waters over a timber apron. The engineering activities of that day, in thus arresting the recession of St. Anthony Falls, makes an interesting chapter in local history. The Mississippi River, for 60 miles above Minneapolis, has its channel in glacial drift. The High Dam in the gorge below is founded on glacial drift mixed with fragments of limestone, while the power-house and the vessel lock, at the two ends of the dam, are founded on sandstone. The Third Avenue Bridge, a recent monumental engineering construction, is founded on the limestone ledge. The sandstone formation is readily tunneled, and Minneapolis and St. Paul, in particular, utilize it very fully for sewers.

With this historic and prehistoric background, the story of more recent developments and present engineering activities should be more understandable.

In the days when Minnesota was on the lonely frontier, St. Paul grew to be its most populous city and, later, its capital, because it was at the head of practicable steamboat navigation—a water reason. Contrary to the rule of growth of cities, which fixes them a day's journey apart, Minneapolis grew into our largest city, centering about the great water power here—a descent of about 48 ft. in a cataract in the Mississippi River, with more than 20 000 available horse-power—another water reason. Another city, Stillwater, grew up at the virtual head of steamboat navigation on the St. Croix River, a tributary stream of the Mississippi which is the trunk line of navigation leading to the Gulf of Mexico.

In passing, it may be of interest to note that, in the division of spoils in State institutions, St. Paul received the desirable Capitol,

Stillwater the desirable Penitentiary, and Minneapolis the then doubtful University, all now centers of engineering activities.

Minneapolis and Stillwater had a kinship in the fact that a form of navigation, much exceeding that of the steamboat in importance, existed in the floating of logs on the Upper Mississippi and the Upper St. Croix, which, with their many tributarities, found their head-waters in the heart of limitless forests of pine, hemlock, and cedar. At Minneapolis the forest products met water power which, with steam power, converted the logs into lumber. At Stillwater, steam sawmills were operated, and the logs were also rafted to continue their journey southward. The floating of logs was the most considerable navigation which the Mississippi River through the State of Minnesota has ever known. It is a familiar fact that a stream which floats logs and crosses a State boundary, ceases to exist only as a child of the State in which it has its source, but becomes a ward of the Federal Government subject to all the limitations and advantages which this implies. The transportation of logs and the cutting up of logs in the past have been essential and important engineering activities which now have practically vanished with the near destruction of the forests.

The water powers at Minneapolis and in the vicinity are the present dominant natural elements which create engineering activities which, in turn, supply other engineering activities. For the future, when population is dense enough, river navigation promises to mean much for Minneapolis, St. Paul, Stillwater, and other river cities.

At the present time, by the building of the High Dam and Lock, between Minneapolis and St. Paul, the actual head of navigation for steamboat service on the Mississippi River is brought to Minneapolis. The construction of this vessel lock and dam is one of the fairly recent engineering activities of the Twin Cities. The evolution of the project from a two-lock scheme which neglected the water power (10 000 h.p.) inevitably present, marks the transition of the Federal Government from the rôle of navigational proprietor alone, blind to other uses, to the larger rôle of master of both navigation and water power. It is a little discouraging, however, to note that for three years, during the war period, when our railways were congested getting coal to this water-power city, much steam-generated power was in use and coal consumed, while potential power equivalent to perhaps from 50 000 to 100 000 tons of coal per year was wasted through the sluiceways or over the crest of the dam. The dam itself is of the Ambursen type, with normal 30-ft. head, with power-house foundations built contemplating a use of 6 000 cu. ft. per sec. in generous river stages. The use of this power awaits action by Congress on a general water power bill.

The main 48-ft. drop at St. Anthony Falls is used largely for grinding flour, the most important engineering activity of Minne-

apolis. The flour mills have a story of their own, and this will be told at the mills to visitors. The annual production of high-grade flour ranges from 16 000 000 to 20 000 000 bbls.

Half a mile down stream from St. Anthony Falls, a second development exists with a fall of 18 ft.—this is used by the local traction company.

As the flow of the Mississippi River sometimes dwindles to 1 000 cu. ft. per sec. in midwinter attenuation, great steam power auxiliaries are everywhere supplied. The Riverside Station of the Minneapolis General Electric Company, with its recently installed 25 000-kw. turbo-generator, is the most colossal auxiliary of the Twin Cities, supplying current to the mills and other manufactories, and to public utilities as well, in times of low river flow.

The water-power plants and water-power sites of the Northern States Power Company on the Mississippi and St. Croix Rivers represent engineering activities, existing and of the near future, of great interest. The Main Street Station develops a portion of the St. Anthony Falls power. The Coon Rapids Dam, with an 18-ft. head, completed in 1914, is on the Mississippi River about 11 miles above Minneapolis. The Taylor's Falls plant of this Company, on the St. Croix River, about 41 miles by transmission line from Minneapolis, has a fall of 60 ft., and 20 000 installed horse-power, mostly used in the Twin Cities for manufacturing and public utilities. The undeveloped dam sites of this Company on the St. Croix and Mississippi Rivers represent, in their future development, problems of exceeding interest. Some of these dams will be on rock foundations, and some of them will mean 30 or 40-ft. heads on glacial drift foundations, which will call for most skillful planning and execution, and, doubtless, when constructed, will mean long strides of advance in the art of dam building on porous foundations.

No summary of the engineering activities pivotal on the Twin Cities can omit mention of the great head-water reservoirs of the Mississippi River. These reservoirs have utilized two large and several smaller natural lakes. Their combined capacity is more than 100 000 000 000 cu. ft., with a water-shed area of about 4 000 sq. miles, and an additional water area of more than 400 sq. miles.

Controlled by the Federal proprietor, who, by law, must regard navigation, however little it is, as the predominant interest to be served, the release of water is not always beneficial to the water powers, and sometimes is detrimental, as in midwinter when power needs are great and river flow is meager. The water powers are really at the present time a greater public resource here than navigation itself. The benefit in vessel draft is about 1 ft. at St. Paul, tapering off to zero perhaps a 100 miles down stream. I imagine it will require an act of Congress to modify the release of reservoir storage so as to give the

maximum benefit to the important water powers of the Mississippi. The attitude of the Federal proprietor is likely to change when the Federal water power at the High Dam becomes a beneficiary.

The things discussed thus far represent engineering activities which are inherent in the physical and geographical characteristics of the Minnesota region. The existence of these things has caused great aggregations of people to cluster here. This population must be served by many engineering activities. Railways must bring to them many things to supplement the regional products, and must take away the things produced here. Minneapolis and St. Paul are two beads threaded on five transcontinental lines; and four axial north-and-south lines reach toward the Canadian storehouse and the Cotton Belt. Locally, we are excellently served by a traction system which is suffering from 5-cent fares and franchise uncertainties.

The water supply here cannot fail to represent an engineering activity of transcendent interest—more particularly after July 1st. The Mississippi River which has served so efficiently in the past in bringing forest products to Minneapolis, brings also the sewage of the City of Anoka, 20 miles up stream. Minneapolis uses the Mississippi River, as it departs southward, to convey its sewage to St. Paul. These two facts made Mississippi River water a bad beverage for Minneapolis and an impossible source of water supply for St. Paul. Up to 1912, Minneapolis did pump its domestic supply unpurified from the river, notwithstanding the malign contributions from Anoka. Well-to-do people bought spring water, crystalline clear, in bottles. Venders sold water as they now sell milk—only seven years ago. The poor and the careless had winter cholera and typhoid fever. The first civic awakening dosed the water with chlorine, which helped while the present mechanical filtration plant was planned and constructed. Investigations for a better water supply gave consideration to four possible sources: Lake Superior, 140 miles away, was alluring. Mille Lacs—a lake 207 sq. miles in area—70 miles away, was enticing. The subterranean artesian supply, rising by gravity to perhaps 100 ft. below the street level here, had many advocates. The Mississippi—"a poor thing but our own"—could not be overlooked.

The investigations resulted in the rejection of the Lake Superior source as too distant, the Mille Lacs supply as inadequate, the artesian as too hard and too uncertain, and the acceptance of the sometimes turbid, sometimes defiled, but always adequate, Mississippi River water, which by skillful engineering processes has been relieved of its baser ingredients and converted into a crystalline, wholesome supply. The typhoid rate in Minneapolis is singularly low. Schools and hospitals freely use the domestic supply for drinking purposes, and all persons may meet confidently the era of alcoholically dry days. St. Paul

secures its water supply from a group of lakes, reinforced by the artesian flow.

In concluding this meandering talk on the things conceived as of vital engineering interest to the Twin Cities and their zones of influence, I wish to speak for a few minutes of the most important inland navigational resource of the world, which now brings steel vessels built on the Clyde in Scotland to our Minnesota harbor at Duluth. As the Mississippi River gives Minnesota a water route to the Gulf of Mexico, the Panama Canal, the Pacific Ocean, and the Orient, so the Great Lakes lead to the Gulf of St. Lawrence, the blue Atlantic, England, France, the Mediterranean, the Suez Canal, and the Indies. Minneapolis is at the utmost inland reach of the Mississippi, and Duluth at the utmost inland reach of the Great Lakes.

Nowhere exist such alluring, splendidly big engineering things, solved and unsolved, as in this chain of magnificent lakes and stately rivers. It has been my privilege to have had a part in the things solved, and it is still my privilege to work on the things unsolved, and I regard myself as peculiarly blessed in working within such far-reaching horizons.

The hematite ore of Minnesota is vitalized and made marketable—80% of the whole country's supply—by this waterway which carries the ore to the coal and brings coal to some of the ore smelted at Duluth. It is probable that the bulk of this ore would lie unmined and unused were it dependent on rail transportation. It costs, roundly, $1 a ton to get the ore by rail 100 miles from the Missabe Range to the lake shore at Duluth, and it costs $1 to carry this ton of ore 1 000 miles by water to Buffalo. The tonnage passing the big ship locks in St. Mary's River, at the foot of Lake Superior, exceeds the combined tonnage of the Panama and the Suez Canals.

Exit from the Lakes to the sea is still limited by the shallow drafts of the Erie, Welland, and St. Lawrence Canals; but the Welland Canal is building now for 25-ft. draft in the canal prism and 30-ft. draft in the locks; and the St. Lawrence waterway will follow this lead. That is one of the big engineering things. The New York State Barge Canal shrinks to a trifling thing, with these great projects evolving.

The Chicago Drainage Canal, diverting a considerable stream of Lake Michigan water, has created the need of the regulation of Lakes Michigan, Huron, Erie, and Ontario, by controlling works in the outflow rivers—Niagara and St. Lawrence in particular. St. Mary's River, the outlet of Lake Superior, is already under artificial control—in the interests of navigation and water power—and projects are maturing for the manipulation of the outflow of the Niagara and St. Lawrence Rivers. Each year to a greater extent it is realized that, after all, the Lakes are storage reservoirs of almost limitless capacity and incalculable value. Nature has one sole motive in her operation of the outflow

rivers, which is to rush the waters to the sea. The water returns through the heavens, and the endless cycle of rainfall and outflow goes on. This water, however, when engineers intervene, must be made to serve better the artificial uses of navigation and power. So it will come to the point where we must budget the water eventually—why not now? Budgeting the water means spending it systematically and scientifically, in well-thought-out apportionments, which will make the Niagara and the St. Lawrence better navigable ways and better water-power streams.

Water power is really the thing which inflames the imagination. Aladdin with his lamp never conjured to serve him genii so omnipotent as engineers have made emerge from seaward bound waters; and the Niagara and the St. Lawrence descending to the ocean hold in their depths potentialities to assume tremendous burdens of labor, which still pitilessly strain human muscles.

These things of which I have spoken I conceive to be, in the largest sense, the significant Engineering Activities of the Twin Cities.

REPORT OF THE COMMITTEE ON DEVELOPMENT

PRESENTED TO THE BOARD OF DIRECTION, JUNE 17TH, 1919.

LETTER OF TRANSMITTAL.

TO THE MEMBERS OF THE
AMERICAN SOCIETY OF CIVIL ENGINEERS:

At a meeting of the Board of Direction held in Minneapolis, June 16th, 1919, the Chairman presented the second Progress Report of the Committee on Development. The Board received the Report, ordered it presented to the Business Meeting of the Convention for discussion and forwarded as soon as possible to the entire membership of the Society and to each Local Association of Members, with the request that the benefit of individual or collective opinion on any or all of the fundamental points covered by this Report be communicated to the Chairman or Secretary of the Committee.

The Committee was, by resolution of the Board, authorized to hold an additional meeting in order to prepare a further report, to be in the hands of the Secretary of the Society by November 1st, so that it may be issued to the membership sufficiently in advance of the Annual Meeting to insure a thorough discussion of it at that meeting.

The Chairman of the Committee on Development requested that he be granted permission to add some material as an appendix to be printed and forwarded to the Membership with the Report, and his request was granted.

In accordance with the above action the Report was presented to the Business Meeting of the Society held at Minneapolis, June 17th, and the resulting discussion will be published in full in the August number of *Proceedings*.

In further compliance with this action of the Board there is herewith presented to each member of the Society the second Progress Report of the Committee on Development, to which is added, as an appendix, a letter from Mr. Onward Bates, Chairman, and other material forwarded by him, with the request that it be published with the Report.

Members are urged to communicate their views promptly to Mr. Onward Bates, Chairman, 332 South Michigan Ave., Chicago, or to Mr. E. T. Howson, Secretary, Transportation Bldg., Chicago.

Respectfully,

CHAS. WARREN HUNT,
Secretary.

NEW YORK, JUNE 27TH, 1919.

To the Board of Direction,
American Society of Civil Engineers:

Gentlemen:—The second meeting of the Committee on Development was held in Minneapolis, Minn., on June 11th to 16th, inclusive, and was attended by the following members:

Onward Bates, *Chairman*

George G. Anderson	George C. Mason
Baxter L. Brown	Edgar S. Nethercut
Paul G. Brown	Frederick C. Noble
J. H. Brillhart	Arthur Pew
Robert A. Cummings	George R. Putnam
W. L. Darling	J. C. Ralston
H. L. Haehl	H. R. Safford
John L. Hall	Charles J. Tilden
Charles Hansel	S. Everett Tinkham
Richard L. Humphrey	Gardner S. Williams

There were also present Mr. C. E. Lord and Professor Kimball, members of the Committee on Aims and Organization of the American Society of Mechanical Engineers, and Dr. Charles Warren Hunt, Secretary of the American Society of Civil Engineers.

The basis of the report herewith is the work of the four sub-committees which were appointed at the November meeting and the main subdivisions represent approximately the scope of the sub-committee work.

A. RELATIONS WITH OTHER NATIONAL SOCIETIES AND RELATED ORGANIZATIONS.

It is the opinion of your committee that the identity of the four existing national societies should be preserved.

The committee believes that the American Society of Civil Engineers should continue to pursue the objects for which it was formed as expressed in the constitution, namely:

"The advancement of engineering knowledge and practice and the maintenance of a high professional standard among its members" and that it should devote its chief endeavors to the performance of these objects. It feels, however, that the time has now come when this society should adopt the principle of becoming an active national force in economic, industrial and civic affairs. This can only be done effectively, however, by active co-operation with other engineering organizations of the country.

To this end the committee recommends that a comprehensive organization be formed embracing:

First—The local affiliation of the branches of the national technical societies and the local technical societies.

Second—A state council composed of representatives from the local affiliations.

Third—A national council consisting of representatives of the national technical societies and of the state councils or state group organizations in lieu thereof.

The object of the council shall be to increase the usefulness of the engineering profession, to bring about greater co-operation and to advance the welfare of engineers.

The council shall have an executive committee, shall maintain a central office and shall hold at least one meeting each year. It would be desirable that a bulletin of general engineering interest be published by the council. The council shall be supported by a per capita contribution or in such other manner as may be determined.

B. INTERNAL RELATIONS AND LOCAL ASSOCIATIONS.

Your committee makes the following recommendations:

1. Local Associations:

(a) That every member of the society be a member of a local association.

(b) That there be created in each geographical district of the society an organization consisting of representatives of the local associations in that district.

(c) That local associations and district organizations shall operate under uniform constitutional provisions to the extent only that the same are necessary or desirable to insure uniform relations with the society.

(d) That the representatives of each district on the Board of Direction and the Nominating Committee of the society be elected by ballot by the corporate members resident in such district.

(e) That it be the duty of each director to visit each local association in his district at least once during each calendar year.

(f) That the Nominating Committee select candidates for the offices of president, vice-presidents, and treasurer, the election of which officers shall be by the ballots of the corporate members.

(g) That there be an annual conference of representatives from the local associations for the purpose of discussing the welfare of the society and its members.

(h) That there be allotted a percentage of the dues of the society to each district organization and each local association for the payment of their expenses.

(i) That the Board of Direction refer, for recommendation, each application for membership to the local association in whose jurisdiction the applicant resides.

(j) That the present provisions of the constitution relating to the discipline and expulsion of members be so revised as to make them more effective.

(k) That it be the obligation of each local association to bring about within its territory a close affiliation of all branches of the national and of the local technical organizations for the purpose of advancing the status of the engineer.

(l) That in communities where members are too few to form a local association, it be their obligation, in addition to that of their district local association, to affiliate with the resident members of other technical societies, and other engineers, where such affiliations will promote the organization to a local affiliate body.

(m) That the local affiliations be the basis for comprehensive state and national organization.

2. Rearrangement of Grades:

That the grades of membership be more clearly defined and that changes be made in the grades of Associate and Fellow.

3. Student Societies:

That it be the duty of the local associations to organize and assist student engineering societies in neighboring engineering schools, to provide carefully selected speakers, and to maintain personal contact with such societies.

(Note: The above is recommended in lieu of establishing the grade of student member and of establishing student branches.)

4. Young Men of the Profession:

That it be the duty of the local associations to provide for the welfare of the younger members of the profession by:

(a) Reasonable representation on the active committees.

(b) Encouraging their discussion of the general problems of the society.

(c) Arranging excursions to works of engineering interest, and

(d) Promoting social intercourse between them and the older members.

5. Personal Service:

That a personal service bureau be maintained by each local affiliation, so organized as to operate in connection with a central service bureau to be maintained by the national council.

6. American Engineers in Foreign Service:

(a) That it be the duty of members resident in foreign countries outside of North America to form associations and to promote an affiliation with the resident members of other American technical societies.

(b) That the Board of Direction consider the feasibility of keeping on record, and providing to American consuls abroad, the names, addresses, and brief professional qualifications of members of the society resident abroad.

C. TECHNICAL ACTIVITIES.

1. Meetings:

That local associations should hold not less than four stated meetings per year and encourage joint meetings with kindred societies.

That the fortnightly meetings of the parent society should be discontinued.

That the semi-annual meetings of the parent society should be supplemented by the addition of a spring and a fall meeting held successively in different sections of the country under the auspices of a local association.

2. Papers:

That the present system of securing papers depends wholly upon voluntary offers and results in a limited variety of subjects. Committees of the parent society and local associations should be formed and charged with the responsibility for promoting greater activity and discussions. Simultaneous discussions of important papers by local associations is desirable.

That the use of the monthly *Proceedings* should be extended to include editorial work, abstracting and reviewing important engineering articles and subjects of popular interest to the great majority of engineers.

3. Committees:

That there be created advisory standing committees of the Board to promote the study of important engineering subjects and charged with outlining and co-ordinating the work of like committees of the local associations. Three members of the Board should constitute a standing advisory committee on each subject. Local associations should urge the younger members to identify themselves with local committee work.

That local associations should suggest names of volunteers possessing necessary qualifications for special committee service, and that tenure of committee membership shall terminate automatically on account of absence or inactivity.

That the society support an active program of research work, co-operating, if practicable, with existing research agencies.

That the chairmen of the standing advisory committees of the board should constitute the Publication Committee.

That to effectively carry out the intent of these recommendations, a technical editorial staff under the direction of the Publication Committee should be established.

4. Sections or Divisions of the Society for Specialized Lines of Work:

It is not recommended that the work either of the parent society or the local association be divided in this way. The object apparently sought by such divisions will be better met by the work of strong committees.

5. Co-operation with Specialized Engineering Societies and Other Organizations:

Much of value has been accomplished in the past in this way and it is recommended that such work be continued and extended.

6. Standards in Engineering Practice:

There exists at the present time a committee known as the American Engineering Standards Committee, composed of representatives of the national engineering societies. This line of co-operation and advice is approved and it is recommended that it be continued and extended, but the idea of developing this committee into another association is deprecated.

It is recommended that a book of recommended practice and standards be compiled which will be revised periodically to follow the development of engineering.

D. RELATION TO PUBLIC AFFAIRS.

1. Definition of Engineering:

That the three main ideas in a complete definition of engineering should be as follows:

(a) A general and descriptive statement.

(b) The content of the profession—the things that engineering does.

(c) The aims and motives the profession should have.

2. Ethics:

That a short code of ethics of broad scope, general character, and positive rather than negative injunction be prepared.

3. Engineering Education:

That a standing committee of seven be created to consider questions of educational policy, and offer advice and guidance in carrying out

such policy. The aims of engineering education, fundamental requirements, changes in curricula, indicated by changing social and industrial conditions, the qualifications of teachers, and the standardization of degrees are a few of the topics which such a committee should rightly consider. Further, that local associations appoint similar committees of three or five to co-operate with educational institutions in their respective territories.

4. Licensing:

That the society in co-operation with the other founder societies prepare a standard form of bill for the licensing or registration of engineers, to be used in the framing of legislation.

5. Arbitration and Expert Testimony:

It is the belief of the committee that the present practice with regard to expert testimony and arbitration is not satisfactory, and it is recommended that a committee of the American Bar Association be asked to co-operate with the joint committee from the four founder societies in order to develop better practice along these lines.

6. Publicity:

It is recommended that the preparation of general articles on engineering subjects be encouraged and assisted by the profession, especially with a view toward having such articles published in the standard magazines.

7. Legislation and Development of Natural Resources:

It is recommended that the national council maintain an agency in Washington, D. C., or elsewhere, for the purpose of keeping advised of all proposed federal legislation and departmental rulings and regulations involving directly or indirectly questions of engineering; and that such agency keep the society or its locals advised from time to time of such matters. It shall also be the duty of the various locals to keep advised on all proposed state legislation affecting engineering matters and the said locals shall actively interest themselves to the end that proper legislation may be enacted. It is also recommended that such agency and the state and national councils shall keep advised as to the proposed creation of federal and state commissions, whose activities may affect engineering enterprise; and that the influence of the locals and the society at large shall be directed towards securing the appointment of engineers upon such commissions.

8. The Service of the Engineer to the Community, State and Nation:

The engineering profession owes a duty to the public which it is believed can best be discharged by the active participation of every

engineer in the civic work of his locality. To this end it is urged that the engineer join the civic body of his community, and if there be no such organization, that he should then endeavor to organize the community for civic work in sympathetic co-operation with the governing body. The engineer's duty to the public also requires that he give his best efforts to matters of state, interstate and national character, calling upon the various engineering bodies for assistance and co-operation when necessary.

9. Patent Law:

Inasmuch as a nation-wide society of inventors has been formed, composed largely of engineers, one of whose objects is to handle the subject of patent law, it is recommended that no action be taken on this subject at the present time.

10. Co-ordination of Government Activities:

It is recommended that the influence of the entire membership of the society be directed toward the creation of a federal department of public works, the secretary of which shall be technically qualified and a member of the president's cabinet, and that the law creating such department shall provide for the co-ordination of all government engineering activities.

11. Industrial Affairs:

That fundamentals of industry and their inter-relation are based on engineering principles which should form a part of the education of the engineer.

JOINT CONFERENCE COMMITTEE.

In accordance with the similar action of the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the American Institute of Mining and Metallurgical Engineers, a joint conference committee was appointed consisting of:

Gardner S. Williams,
George G. Anderson,
Richard L. Humphrey.

The Committee on Development submits this report in accordance with the following resolution:

Whereas, The Committee on Development in considering the subjects assigned to it has arrived at certain fundamentals which it is anticipated will form the basis of its ultimate report;

And Whereas, the Committee thinks it desirable to have a discussion of these fundamentals by the membership of the society; therefore, be it

Resolved, That these fundamentals be submitted to the Board of Direction with the request that they secure the views of the membership thereon.

Respectfully submitted,

ONWARD BATES,
Chairman.

E. T. HOWSON,
Secretary.

Minneapolis, Minn., June 16th, 1919.

APPENDIX.

Letter of Transmittal.

MINNEAPOLIS, JUNE 19, 1919.

DR. CHARLES WARREN HUNT, *Secretary,*
American Society of Civil Engineers.

DEAR SIR:

At the meeting of the Board of Direction held in Minneapolis on the 16th inst., I presented to the Board the Second Progress Report of the Society's Committee on Development and was informed that the report would be printed and sent to members of the Society.

I asked the Board's permission to add some material which should also be printed and sent out with the copies of the Development Committee's Report and the Board granted my request.

It was my intention to go over the files of the Development Committee, and with the aid of its Executive Committee, to make a selection of material which should include your address to the committee for the purpose of aiding members in presenting to the committee their suggestions and criticisms. I have not been able to get a quorum of the Executive Committee, and therefore enclose with this only your address which has specially interested some of the committee men.

My personal opinion is that your address contains ideas and statements which should be fully considered in debating the whole subject of development. If we followed our usual custom, your address would be mimeographed and sent to members of the Development Committee and I think we are fortunate in having the opportunity to send copies of it to all members of the Society.

I ask you to impress upon our members the importance of sending to the committee their suggestions and criticisms at the earliest possible date.

Yours truly,

ONWARD BATES, *Chairman,*
COMMITTEE ON DEVELOPMENT.

Statement Made to the Committee on Development at its Meeting in Minneapolis, Minn., June 13th, 1919, by Chas. Warren Hunt.

I have now been consecutively engaged in the work of the American Society of Civil Engineers for more than twenty-seven years. I am sure that I cannot express the point of view which that experience has given me, of the relation which should obtain between the Society and its membership, as clearly and forcibly as it has been stated in correspondence forwarded to me, for my information, between Mr. John W. Alvord and a member of the Society, an old acquaintance of his, who wrote to him as the Director representing the District in which he lives. The general attitude of this letter to Mr. Alvord was exceedingly pessimistic as regards the Society and its so-called failure to do what it should do for its membership. It blamed in no uncertain

terms the management of the Society and mentioned the present Secretary by name as being the chief offender.

I beg that you will understand that in venturing to present parts of Mr. Alvord's reply, that there is no personal feeling in the matter whatever, and if all of it which relates to the present incumbent of the Secretaryship could be eliminated, and the same force of argument preserved, I would omit it altogether, but this letter having been seen by a number of members of the Society, the general opinion is that it would have done much good had it been published so that every member could have had the opportunity to get Mr. Alvord's point of view.

"As noted by you, and answering your letter in a general way, I would say that in my younger days I often felt much as you do about the American Society of Civil Engineers, but as I have grown older, and especially since I have been on the Board of Direction, I have come to observe a good many things which I never realized before.

"In the first place, I think your whole idea of Engineering Societies is wrong. An Engineering Society is not something that you are to get something out of, wholly. It is something that you are to put something into, and it is a question of what we can all give the profession through our technical societies—not what we are not getting. This point of view answers practically the whole of your complaint. As an engineer you owe the profession more than you can ever repay, because you have been absorbing the recorded experience in an Engineering Association ever since you have been in practice to an extent greater than you can ever possibly repay, and it is only a question of how we can all liquidate our debt to those who have gone before us, who founded the Society and brought about this method of aiding the future engineers, who are constantly coming up through the different grades of experience, and looking for information."

Mr. Alvord then points out that the center of population of the Engineering Profession is not coincident with the center of population of the country, and that in a general way, in his opinion, the former must be somewhere in the vicinity of Southern New York or Northern Pennsylvania, in the vicinity of Elmira or Binghamton, and not with the center of population of the country, somewhere Southeast of Indianapolis. He states that this means that a very large proportion of the Engineering population (over 40%) are within easy reach of the headquarters of the Society, and that New York City is therefore the logical place for such headquarters. Continuing he says:

"Bearing this in mind, I find in the Board an exceedingly deferential attitude toward the outlying districts, and a willingness to concede them larger representation and larger influence in the Society than would be their due numerically. This is notably true of the Development Committee, for instance, which has been made up most largely from the outlying districts, and is not representative, territorially, of the Society at large.

"I have only been on the Board a little over a year but during all of that time I have never once seen a disposition to center anything at New York that could possibly be done outside. Of course, there are matters in which close attendance at the meetings is desirable, and there are some emergency matters in which local people only can be selected on account of lack of time and the uncertainty of getting the attention of outlying members, but these are the only instances, and proper instances, of exception to the rule."

He speaks in detail as to the purely temporary financial condition of the Society, the reasons which led to it, etc., and then continues:

"With reference to Mr. Charles Warren Hunt as Secretary, I may say that however you may feel personally about him, as a man certainly you must admit, as I have had to admit, that he is a most efficient executive and as keen a business man as the Society ever had for Secretary. For a profession which is always grumbling about its compensation, to turn around and grumble about the compensation it will pay to so satisfactory a man, who holds the welfare of the Association in such good shape, due to his executive and business ability, is, to my mind, wrong. Let those among us who can well afford to ask other people to be generous to us with emoluments, be generous towards others. Mr. Hunt has not always succeeded in retaining as his personal friends every member of the Society, but I have never heard of anyone who was convincingly able to prove that he was not an excellent business man, an efficient organizer, and an efficient Secretary. Certainly my own observation of his work during the past year has convinced me that he is well worth all that we pay him. The work of the Society is very much greater than anyone can possibly imagine it to be."

Perhaps I may be held to be immodest in reading this statement, but my reason for so doing has been previously given. In addition to this, similar criticisms to those of Mr. Alvord's friend have been frequent for many years, and to my knowledge were used long before my official existence. Within the last few months, statements of the same general tenor were made and published in an anonymous communication signed "M. Am. Soc. C. E." in *Engineering News-Record*—not only referring to me but to the secretaries of all of the Founder societies. The editor of that journal when the Board of Direction asked for the name of the individual, exercised his editorial prerogative, and said that the writer of the anonymous letter objected to the disclosure of his name, adding: "You doubtless can appreciate his feelings and sentiments in the premises."

Mr. Alvord continues:

"I have given a great deal of attention to the present unrest in the engineering profession. The most of our troubles come from self-centered narrowness, and what the engineer of today lacks is breadth of view, less envy and jealousy, and more interest in the business and political world. I have been greatly impressed in the last few years—and I have now been practising my profession for nearly 40 years—with the fact that envy and jealousy are at the root of a great deal of engi-

neering discontent. We begrudge other people their success. We begrudge the heads of our profession their notoriety, and we tear down other people's reputations in our profession altogether too freely and thoughtlessly. We should, I think, pay particular attention to those members of our profession who have done good work. It does no harm to praise them a little, and it is a good way to make friends. The engineering profession will never grow big and broad until its members' mental attitude grows big and broad.

"I have written you very frankly and fully, because I think in answering you I am answering a number of other men who have had erroneous impressions of the attitude of the New York membership, and, particularly, the leading members on the Board of Direction toward the outlying members."

If I am not very much mistaken the original idea of the Development Committee of the American Society of Civil Engineers was the development of the Society itself to meet existing and changed conditions due to the war, etc., and that to its duties was added later the question of co-operation with other bodies for the general good.

I have not been asked, as I understand it, to come here with any suggestion as to improvement in methods of the Society's work, nor do I know to what extent the Committee has decided on suggesting fundamental changes, but I believe that it is entirely proper for me to discuss that part of the problem which relates to the co-operation between organizations, inasmuch as that has nothing whatever to do with the management of the American Society of Civil Engineers. I have therefore ventured to write out, as briefly as possible, a statement of my views, based upon a great deal of careful thought and considerable knowledge of conditions both at headquarters and in various parts of the country.

There are in my judgment two entirely separate phases of the general subject of the condition of the Engineering Profession.

(1) The theoretical, scientific, educational side, which includes the maintenance of high professional and ethical standards, and

(2) The welfare side, which includes all matters relating to the Profession outside of those in No. 1. This means not only the participation of the Engineer in civic and community affairs, but concerted action connected with National, State and Municipal problems, in which the welfare of the members of the Profession both individually and collectively is concerned, such as professional rates of pay, employment of engineers, and all legislation which affects the Profession either locally or nationally.

In my opinion, these two lines of effort cannot be carried on together. The National Engineering Societies are well organized for, and can carry on, the first of these, and they should not be interfered with nor hampered by being forced to undertake the second.

If this be true, then the problem is to so organize the Engineers of the country that they may be able to handle both national and local matters concerning the welfare of the Profession. My experience is that the chief difficulty in the attempts which have been made up to the present time in co-operation among various groups of Engineers is that we have been trying to work from the top down and not from the bottom up. I think that true co-operation must have its source in the individual, or in smaller geographical groups of individuals, which groups shall elect their representatives and instruct them as to the lines on which they wish co-operative effort made. They must also finance that effort in proportion to the numerical strength of each sectional or geographical group.

At present, boards of Engineers elected for the specific purpose of managing an individual organization—and for that purpose only—are transferring certain powers which have been given them—and perhaps a number of others which they have never possessed—to another group of their own appointees. Apart from the question of whether they have the constitutional right to transfer powers granted them by their constituents, the result is not satisfactory. A man so appointed is not really responsible to anyone—he has no constituents or electors to whom he must report and whatever action he may take on any matter must therefore be entirely dependent on his personal views.

I believe that the Engineers of the country can be organized by forming a truly representative body which might be called "Engineering Council", for want of a better name. The first difficulty which to my mind presents itself is that at present there is no method of determining who may, or who may not, be properly classed as Engineers except by the assumption that all men who have been admitted to a national organization can qualify. With this brief statement I would suggest:

That through the co-operation of the Development Committees of the four National Societies a plan be developed along the following lines:

That in each center of population there be formed a local Engineering Association to be known by the name of the city or by some other distinctive sectional name.

That the voting membership of each of these associations be limited to the membership in any grade of any National Society of Engineers residing in the territory covered by the association. It will be observed that this is not intended to restrict the membership to the four Founder Societies only. That Engineers in the territory who are not connected with any of the National Societies be admitted as "Associates" or "Affiliates", until such time as they become connected with the national organization representing their specialty.

These associations would have two functions, viz:

(1) To act upon all local matters whether Municipal or State (the latter in connection with similar associations).

(2) To elect directly in proportion to its numerical strength, or, if not large enough, in connection with its neighboring associations, its proportionate representation on a National "Engineering Council", and to contribute in similar proportion to the support of that Council.

The advantages of such associations would apparently be: Added numerical strength in each locality; local recognition of the fact that all members are Professional Engineers—in other words, something definite as to who is and who is not an Engineer—and direct touch through properly elected representatives, responsible to and reporting back to their constituents all actions of the "National Council". In addition to this each would be, so far as local matters are concerned, not responsible to any National Technical Society, which condition at the present time is a more or less troublesome one, for we all know that the question of the relation of the present "Local" association or section both to the parent organization and to similar locals has been, and still is, subject to much debate. In one case at least a parent National Society found it necessary to repudiate action taken by one of its local chapters.

In addition to the representatives elected in accordance with the above each National Technical Society should be authorized to appoint one or more members of the "National Council". These appointees would be the logical representatives of the very large membership in these societies which is not connected with any local association.

If this plan were considered feasible and developed by our Committees in connection with the Development Committees of other Societies, on the present basis of membership of the four Founder Societies alone there would be a general Local Engineering Association of approximately 6 600 members in New York City, and in San Francisco it is estimated that there might be more than 800.

Nothing that I have suggested above would interfere with the maintenance of the present Local Associations or Chapters of the Founder Societies, but they would be relieved of the necessity of acting on matters which are not strictly those which belong to the parent Society. In other words, they would act only on matters which affect the policy of the National Societies of which they are Local Chapters.

REPORT OF THE DELEGATION OF AMERICAN ENGINEERS

TO THE

AMERICAN SOCIETY OF CIVIL ENGINEERS
AMERICAN SOCIETY OF MECHANICAL ENGINEERS
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
AMERICAN INSTITUTE OF MINING ENGINEERS

The Delegation of American Engineers, constituted by your Societies to visit France in December, 1918, in acceptance of the invitation extended by the Congrés General du Génie Civil, beg to submit the following report and an account of its mission.

As constituted by your Societies, the Delegation consisted of the following members:

Representing the American Society of Civil Engineers:
James F. Case, Chairman of the Commission,
George F. Swain, Past-President,
Nelson P. Lewis, Vice-President,
George W. Tillson, Treasurer,
George W. Fuller, Past-Director,
A. M. Hunt, Director.

Representing the American Society of Mechanical Engineers:
Charles T. Main, President.

Representing the American Institute of Electrical Engineers:
Lewis B. Stillwell, Past-President.

Representing the American Institute of Mining Engineers:
E. Gybbon Spilsbury, Past-President.

The Delegation organized on the way over by the choice of Maj. James F. Case as Chairman, and George F. Swain as Secretary, and by the organization of the following Committees, the Chairman being *ex officio* a member of all the Committees:

1.—*Committee on Commercial Ports.*—Messrs. Case, Chairman, Main, Spilsbury, Hunt.
2.—*Committee on Water Power.*—Messrs. Stillwell, Chairman, Hunt, Main, Swain.
3.—*Committee on Navigable Waterways.*—Messrs. Swain, Chairman, Main, Spilsbury.
4.—*Committee on Roads.*—Messrs. Tillson, Chairman, Lewis.
5.—*Committee on Technical Education.*—Messrs. Swain, Chairman, Main, Stillwell, Spilsbury, Hunt.
6.—*Committee on Agricultural Development.*—Messrs. Fuller, Chairman, Lewis, Tillson.

On arriving at Bordeaux, on December 16th, 1918, the Delegation was met by S. D. Brown, Assoc. M. Am. Soc. C. E.; and on arriving in Paris the same day, it was joined permanently by the following attachés:

Capt. P. Charton, of the French Engineers, Delegate of the Commissariat-General to accompany the Delegation and serve as Liaison Officer; Capt. Carpenter, of the American Army; Mr. S. D. Brown; and Mr. George Herdt, representing the Society of Civil Engineers of France.

These gentlemen were of the greatest assistance to the Delegation during its stay in France, and the Delegation cannot sufficiently express its obligation to them.

The Congrés General du Génie Civil, representing engineers, manufacturers, and public men, interested in the problems of engineering, had held meetings in March, 1918, at which a large number of papers had been presented and discussed. The Congrés had considered and published these papers and had passed resolutions with reference to a large number of them. On the way over, the members of the Delegation had read the papers relating to the subjects of their Committees, and were prepared, therefore, to discuss them and the resolutions with the members of the Congrés.

The object of the visit was to discuss with the French engineers the large engineering problems now facing France. Many of these were treated in the papers presented to the Congrés, while other matters were brought up before the Delegation. The Delegation was also offered the opportunity to visit various parts of France, to see the harbors, the water powers, many large engineering works, and some of the regions devastated during the war.

The visit of the Delegation was occupied as follows:

December 16th to December 26th, 1918.—At Paris, holding Committee meetings, visiting certain industrial establishments, and meeting the French engineers.

December 26th.—Left Paris in the evening for Nantes.

December 27th.—Visit to the Port and City of Nantes.

December 28th.—Left Nantes by boat for St. Nazaire. Visit to the Port and City of St. Nazaire. Left in the evening for Paris.

December 29th, 1918, to January 4th, 1919.—In Paris, visiting schools or industrial establishments, or holding meetings, with the exception of two days which were devoted to visiting the front; the first day to Albert, Arras, Lens, and Amiens, and the second day to Chateau Thierry and Soissons.

January 4th.—Left in the evening for Grenoble.

January 5th and 6th.—At Grenoble, visiting hydraulic works, or holding meetings with the Chamber of Commerce.

January 6th.—Left Grenoble in the evening, arriving in Marseilles the following day.

January 7th and 8th.—At Marseilles, visiting the port and the works for its expansion, and the construction of a navigable waterway from the port to the Rhône.

January 8th.—Left Marseilles in the evening, arriving at Lyons during the night.

January 9th and 10th.—At Lyons, visiting industrial and hydraulic works, and holding meetings with the Chamber of Commerce and other bodies.

January 10th.—Left Lyons in the evening, arriving in Paris the following morning.

January 11th to 16th.—In Paris, holding final meetings with the Committees, attending final meeting of the Congrés, making the acquaintance of Ministers and other officials, etc.

January 16th.—Left Paris in the evening for Bordeaux, arriving the following morning.

January 17th and 18th.—At Bordeaux, visiting the port, the works constructed by the American engineers, and the city.

January 18th.—Embarked in the evening for the return trip.

As a result of this visit, the members of the Delegation feel that they have gained a fairly good idea of the conditions in France and of the problems which confront that country. As a result of their discussions with the French engineers, the excursions which they made, and the study of the reports of the Congrés of March, they were able to leave with the Congrés a preliminary report, a copy of which is appended hereto. (Appendix I.) This report is herein expanded and made more complete, and some further information, with reference to American practice, which was requested by the French engineers, is furnished.

A copy of all information sent by the Delegation to the French engineers will be submitted to your Societies. For the present, it will be sufficient to indicate briefly the work of the various Committees, together with some general considerations.

General Aspects of Reconstruction in France.

There are so many reconstruction problems that were not touched upon at the Engineering Congress at Paris in December, 1918, and January, 1919, during the second month after the signing of the Armistice, that it will be helpful to the reader of this report to explain some of the general conditions surrounding this broad problem. Obviously, there are many reconstruction problems which the French, following their repeated discussions in earlier years, have either settled, or consider that they are able to settle in the future, without outside

aid. Other problems cannot be pronounced upon until further progress has been made toward the establishment of permanent peace following the cataclysm through which a large portion of the world has just passed.

It is well to bear in mind that different meanings may be attached to familiar words, such as reconstruction, readjustment, rehabilitation. At the outset, it is important that the meaning of reconstruction be defined.

It is obvious that there are three aspects or stages to the problem of reconstruction for each country which has been involved actively in the world war. In the first place, following the cessation of war, comes a period of transition or readjustment, in which industries which during the war were engaged in war work, are adapted to the work of peace. This period is now in progress in France and elsewhere. Some plants which were making shells, are transforming their equipment to manufacture automobiles, or even are planning to use their buildings for slaughter houses. Some plants which during the war were making aeroplanes, are planning to manufacture furniture, doors, windows, and blinds.

Next, will come what may be termed the period of rehabilitation, in which the physical destruction of property caused by the war will be made good as far as practicable.

Finally, will come the period of reconstruction proper, in which the problems will be to adapt the industries, customs, and practices to the new economic conditions which will result from the establishment of permanent peace.

While much has been written concerning all three aspects of the broad problem of reconstruction, yet it is well to remember that, at the time of the visit of the American Delegation to the Engineering Congress at Paris, only a few short weeks had elapsed since the cessation of active hostilities. Demobilization of the French Army had come to only a few of the older classes and officers on special detail. With the British Army, demobilization was practically limited to coal miners and pivotal workers in the industries. Something like 100 000 American troops had been sent home, but the Italian Army had not been demobilized at all.

The Delegation thus found in France scarcely the beginnings of the period of readjustment. It is true that munitions plants and certain other war industries had shifted from their full war-time schedules, had ordered equipment for peace-time manufacturing programmes, and were in the midst of putting underway a change in methods, organization, and programme, to be carried out in the future as promptly as practicable.

It is important to note, however, that transportation facilities were found to be rather worse in France than during hostilities. This was

due to the added demands made on the French railroads for rationing the armies of occupation along the Rhine and the civilian populations of Belgium, Alsace, and Lorraine, to say nothing of the movements of troops on leave, bound for Central and Southern France.

With reference to rehabilitation, as applied both to the devastated area and to war industries, there was an inactivity which at first seemed surprising even to the point of suggesting apathy. Further contact with conditions in France, however, showed that this was a natural result of the uncertain knowledge on the part of those interested as to what reparation and indemnification would be received, how it would be distributed, and what work should be undertaken. Actual rehabilitation depends on available funds, and programmes can be definitely formulated only when this is settled.

One phase of the situation in France should be kept in mind, particularly by the American who may characteristically anticipate that rehabilitation work should begin coincident with the cessation of hostilities. This is the fact that the period of the Peace Conference is also a period of quiescence immediately prior to parliamentary elections. Normally, the spring of 1919 would see the election of a large number of members to the French Senate and Chamber of Deputies. Under the French law, the soldiers cannot vote while mobilized. To disfranchise them from a National election is unthinkable. To allow them to vote at the front, or wherever they may be mobilized, requires a new law which has not been passed for a number of reasons, one of which is that the members of Parliament who will continue in office until their successors are elected, are awaiting news as to when demobilization will occur.

For the reasons pointed out, neither the American Delegation nor the recent Congress of Civil Engineering at Paris dealt with the programmes of readjustment or with those of rehabilitation. Their work related solely to the problems of reconstruction. That these problems are of the greatest magnitude and seriousness for France will be evident when it is remembered that, after the Peace Conference specifies the terms of peace and indemnification, and war credits cease, it is estimated that France will have annual Governmental budgets several times those before the war.

There can be no doubt that, after peace conditions rule, there will come a period of strenuous commercial struggle. To prepare for this, the French Congress of Engineering desired to ascertain from the American Delegation what American experience suggests, and hereafter may suggest, as to procedures helpful to both nations, and especially how France could meet its colossal problems. Co-operation between France and the United States was the watchword throughout.

Engineering problems in their restricted technical sense came up for discussion practically not at all, for the excellent reason that the

French do not need advice nor assistance along strictly scientific lines. It was in the larger and economic aspects of engineering, to aid in building up the industries and commerce of France, that our French associates desired to learn from the experience of the American Delegation.

Committee on Ports and Navigable Waterways.

These subjects were covered by one Committee instead of by two as originally contemplated, with the membership remaining unchanged.

This Committee held three meetings with the French engineers—on December 19th and 21st, 1918, and January 15th, 1919. At the meetings of the Committee, the situation with reference to the French ports was described and, as already stated, the Delegation had an opportunity to visit several of these ports.

Unquestionably, facilities at the French ports were insufficient even before the war; and if, as must be the case, the conclusion of the war results in the re-arrangement of trade routes and a greater traffic between France and other countries, the insufficiency will be still more pronounced after the war, unless immediate means are taken to increase the facilities.

Indeed, France has done much during the war to improve and increase facilities, and, in some cases, the work of American engineers has contributed largely to this end. On the Loire, and on the Garonne, a great increase in facilities offered has taken place, and this, the French engineers state, must be continued. It appears that the experience in carrying on harbor and river works in France has been very similar to that in the United States. All harbor and river works are carried on by the State, by money provided by the budgets. This has resulted in a scattering of resources, a lack of continuity, and a failure to concentrate and carry on important works to completion. The French engineers admit that this was the case, and that their methods must be changed, and that private initiative in each port should be encouraged in works of this kind.

It was also stated that some change in banking methods would also be necessary, the great French banks having taken no part in making funds available for the execution of public works. The Chambers of Commerce of the maritime ports have important resources which have been and can be made available in providing funds. These Chambers of Commerce are authorized by law to issue and guarantee funds for such purposes, in very large amounts, the security being furnished by charges on the commerce of the ports. In this way, the Chamber of Commerce of Marseilles has recently made itself responsible for some 40 000 000 francs for the enlargement of the port and the construction of the canal between the port

and the Rhône, the interest on this expenditure being met by a charge on the gross tonnage and on the individual merchandise.

The Government has already made extensive projects for the improvement of the ports, and has been contemplating the provision of complete facilities for all the commerce which can be expected. The French engineers recommend that, in carrying out this programme, efforts be first concentrated on the larger ports, *viz.*, Dunkirk, Havre, Rouen, St. Nazaire, Nantes, Bordeaux, and Marseilles.

Some of these ports are above the mouths of the rivers on which they are situated, and involve a considerable length of river navigation. Thus, Rouen is some 70 miles from the mouth of the Seine, while Havre is at its mouth. Nantes is 37 miles from St. Nazaire, which is at the mouth of the Loire River. Bordeaux is 62 miles from the mouth of the Gironde.

Marseilles is in a somewhat exposed position on the Mediterranean and about 20 miles distant from the outlet of the inland sea, known as the "Etang de Berre", which is being connected with the port by a tunnel and canal and is to be developed into a part of the Port of Marseilles.

In connection with the ports of Nantes and Bordeaux, and the river navigation up to them, the plans involve in some cases the construction of canals to avoid difficult places in the rivers.

The plans already prepared by the Government involve, as stated, an expense of 250 000 000 francs for Dunkirk; 200 000 000 francs for Le Havre, in addition to 80 000 000 francs for an exterior harbor; and 350 000 000 francs for Marseilles. The total expenditure contemplated by these plans represents 2 500 000 000 francs, which it is expected will not only construct, but equip, these ports in a manner which will enable them to meet all future requirements.

The French engineers asked the opinion of the Delegation with reference to the greatest dimensions of vessels which should be provided for, and, after some discussion, it was agreed that the following should be adopted: Length, 1 000 ft.; width, 100 ft.; depth, 40 ft.

Many of the French ports, having a rise of tide of from 16 to 18 ft., have been provided with interior basins entered through lock-gates. The opinion of the Delegation was asked as to whether these were necessary. The Delegation replied that experience in America indicated that they were not necessary with a range of tide of 15 ft. and probably for a considerably greater range, but that, with proper equipment for loading and unloading, vessels could lie directly along the wharves in the rivers.

The Delegation was asked with reference to the method of administration of American ports, whether by the State, the City, or by Private Companies. The Delegation promised to furnish a report on this subject.

The Delegation was also asked with reference to dimensions and methods of construction of dry docks, floating docks, and dredges, and with reference to mechanical equipment. The Delegation promised to send a supplementary report dealing with this subject also.

It appears that, in some French colonial ports, the construction of works is made entirely or partly under a concession, instead of by the Government, and the French engineers expressed the opinion that it was possible the Government might adopt this method for French ports.

The French ports do not appear in the past to have been connected sufficiently with the railroad lines, not only because the ports were public property, constructed and operated by the State, while the railroad companies were private companies, but because the French have not sufficiently learned the benefits of co-operation between the two. This situation, however, seems to be changing, and one of the French railroad lines has asked for a concession giving it the right to place its tracks in close connection with one of the newer port developments, offering at the same time to equip these tracks with all necessary mechanical equipment for unloading coal and loading iron ore.

As already stated, the facilities at some of these points have greatly increased during the war. This is specially the case at Nantes and St. Nazaire—largely through the efforts of the American engineers.

A short distance above St. Nazaire, the American engineers have constructed an immense storage plant for supplies, and a railroad freight yard, and a second track was laid through St. Nazaire and Nantes. It is worthy of mention that the laying of this second track probably made it possible to send several hundred thousands of American soldiers to the front at a critical time, who could not otherwise have been sent; so that this work may be considered to have contributed in a large degree to the winning of the war in 1918. These railroad facilities should be of great service to the ports of St. Nazaire and Nantes, in enabling them to handle freight for transport into the interior and to Central Europe and the return freight for export.

The ports of St. Nazaire and Nantes appear to have a great future, the former especially for vessels of deeper draft which desire to avoid the river navigation up to Nantes. The River Loire offers a convenient and favorable line to Central Europe, effecting a saving of distance, from New York City to Berne, for example, as compared with the route *via* Hamburg or Bremen and south through Germany, of something over 500 miles. The grades up the Loire are easy, and the conditions appear to be altogether favorable.

Some further railroad improvements are undoubtedly necessary, as, for instance, in passing through the City of Nantes.

The work of the American engineers at Bordeaux was also of great importance in the war, and of great interest as an improvement of the port. They constructed a considerable length of dock along the river, while the French constructed other new docks. These altogether have increased very much the capacity of the port. Before the war, there was a length of 6 500 m. of docks, and 3 500 m. more have been built during the war.

At Marseilles, very extensive works have been planned and partly carried out, including the canal to the Etang de Berre, which will pass through a tunnel having exceptionally large dimensions, *viz.*, length, 7 000 m.; width, 22 m.; height, 14 m., and cross-section, about 360 sq. yd., with a depth of water for barges of 3½ m.

It is contemplated to make at the Etang de Berre, which is a deep water inlet, a port having a capacity of the entire present Port of Marseilles.

Altogether, the future of the ports of France seems to the Delegation to be very bright, if the expenditures necessary for their development are concentrated and expended with efficiency.

France has a considerable system of internal navigation, consisting of canals and canalized rivers. In 1913, the last year for which statistics are available, there were in use 4 025 miles of canalized rivers, and 3 050 miles of canals, almost all of which were operated by the State.

On all these canals which belong to the State, there is free navigation without any charge. The State pays the interest on the cost, and also the cost of maintenance. Under such circumstances, the cost of transportation by canal and by railroad is, of course, no indication of the relative economy of these two methods of transportation.

The Commission has been impressed with the situation just explained and the fact that works of interior navigation, like harbor works, are constructed by the State. Many French engineers, like many in this country, and other countries, seem to be greatly attracted by projects of interior navigation. They certainly offer interesting fields for engineering design and construction; but more important than engineering design and construction is the economic study of the works proposed. We have had in the United States many illustrations of the waste of public money for such projects. We have seen some of the States obliged to repudiate debts contracted for canals, and the abandonment of almost all our canals. We fear that in France and elsewhere, there may be some danger of a similar waste of resources; and while there is no question that canals, where economically justified, may have great value, we have urged in our preliminary report that every new project should be thoroughly studied from the economic point of view, taking account of all elements of expenditure and all

sources of income, including, of course, any interest or maintenance charges paid by the public directly or by taxes.

In America, it may be stated with fairness, works of internal navigation have not as a rule been successful. The conditions in France, however, are more favorable, because there is less interference of traffic, and because some of the rivers, especially in the north of France, have very favorable slopes. Nevertheless, it is important to remember, in France as well as in America, that when the State, that is to say the people, pays all interest and maintenance charges, and when this fact is ignored, the people may be burdened with expenditures for public works that are economically unsound. The cost is always paid by somebody, and when transportation facilities are to be improved, the comparative advantages and disadvantages of railway and canal should be carefully considered, every item of cost being included in both cases.

The existing canals in France, should be utilized, of course, to the full extent that they are economically utilizable. Some of the waterways, particularly the River Seine, have been of great service during the war. The Seine, however, in some respects is a special case, not representative of conditions found elsewhere. Great quantities of coal and other heavy material are brought from abroad, notably coal from Wales, to the mouth of the river, and carried up to Paris in barges.

In the flat country in the north of France, canals may be the most economical means of transportation, even taking into account all elements, whether paid by the State or by others, but the south of France which is far from flat, is quite different, and it does not necessarily follow that canals and river improvement would be economical there.

It is obvious that transportation is a case in which the law of increasing returns is particularly applicable. When the means of transportation are once provided, an increase of business can be handled with much less than a corresponding increase in expenses. If both means of transportation, namely, rail and water, are provided between given points, neither will be able to do the work as cheaply as one means alone could do it.

Inland waterways cannot transport all kinds of material in a way to conform to modern requirements, as, for instance, perishable goods and others which require speed.

Railways, however, can transport all kinds of material. Where there are large quantities of heavy material awaiting transportation, which need not be carried rapidly, if transhipment is not necessary and if topographical conditions are favorable, the construction of a canal may be economically sound, but even under these favorable conditions the comparative advantages which would result from investment of an equal sum in improved railway facilities, should be carefully

considered. And where public money is to be invested, the fact that the service rendered by the canal is primarily local while that rendered by the railway is not only local but general, owing to the fact that cars running over the new line can be forwarded without transhipment of goods to any part of the country, should not be overlooked.

The economic and technical situation at the present day, in our opinion, both in America and in France, distinctly points to the desirability of developing transportation by railway to the greatest extent possible, practically and economically, and developing inland navigation only in cases where that form of transportation can be shown to be superior to railway transportation, all elements being considered. The railway is more rapid, less subject to interruption, and it can carry goods from the point of origin to the point of destination without changing of cars. A canal cannot do this, and, generally, in connection with inland transportation by water, railways have to be used a part of the distance.

Water transportation from source to destination, therefore, generally means both water and rail transportation. The cost of transhipment is one of the important elements which must be considered in the economic study of a transportation problem.

At the present time, the nations of the world are burdened with enormous debts, contracted on account of the war. The interest on these debts will be a serious and perhaps a crushing burden. It is all the more important—indeed, it was never more important in the history of the world—that there should be no waste of public money and that all expenditures should be made with economy and for projects which are economically sound.

Committee on Water Power

At the several sessions of the Water Power Committee of the Congress, a number of very interesting communications were presented by distinguished French engineers and administrators. Among these were descriptions of proposed water-power developments on the Upper Rhône, by M. Boissannas and by M. Maillet; a description of the proposed control of the Durance and its utilization for irrigation and power, by M. Wilhelm; and a statement describing the electrification of the French railways and the proposed water-power development of the Upper Dordogne, by M. Sabouret. The information thus secured by the American Committee was supplemented by visits to a number of the water-power developments in the vicinity of Grenoble, and by many printed documents which were placed at its disposal by officers of the Congress and others.

There are three important water-power districts in France, namely, the region of the Alps in the southeast; the northern slopes of the

Pyrenees in the southwest; and the centrally located mountain region rising to heights of more than 6 000 ft., the northern and western slopes of which are drained, respectively, by tributaries of the Loire and the Garonne. Of these, the region of the Alps drained by the Rhône and its tributaries is by far the most important. Here, in a territory approximately 200 miles long and 100 miles wide, the aggregate developable water power at low-water flow, according to an official estimate, approximates 3 000 000 h. p., and, at average water flow, 6 000 000 h. p. Elsewhere in France, the same estimate gives an aggregate of about 1 500 000 developable horse-power at low-water flow and 3 000 000 h. p. at average flow. The greater part of the water power outside the region of the Alps is found in the Pyrenees.

According to statistics of the French Water Power Commission, the hydraulic power capacity installed in the region of the Alps, on December 31st, 1915, was as follows:

Power for light and power purposes.....	291 000	h. p.
" " electrometallurgical works.....	255 000	"
" " electrochemical works.....	147 000	"
" " electric traction	16 000	"
" " paper mills, saw-mills, etc.....	23 000	"
" " various industries (lime and cement works, spinning, etc.).....	6 000	"
Total	738 000	h. p.

At the end of June, 1918, under the stress of war conditions, the amount of power developed in this region had been largely increased. In the Dauphinè, for example, according to figures obtained from the American Consul at Grenoble, the aggregate power produced by hydro-electric plants had increased from 170 000 to 220 000 h. p., and the work of extending existing plants and building new ones was in progress at the time of our visit, apparently to the limit fixed by available labor and material.

The vicinity of Grenoble is the birthplace of the art of utilizing hydraulic power under high head, and hydro-electric power is used there for many purposes of special interest to the chemist and the metallurgist.

Among the establishments in the Valley of the Isere, which were visited by the Committee, is the paper mill of Bergès at Lancey, where a turbine designed by M. Aristide Bergès began successful operation in 1869, on a head of approximately 200 m. At this place wheels are now in operation under a head of about 500 m., and the Committee was informed that this establishment was using wheels under the head named as early as 1882. It is said also that the wood pulp grinding machine of the type now generally in use was invented by Bergès in

1865. The labor employed at the time of our visit included a very few French men, a considerable number of French women, a large number of Annamites, a few Arabs, and some German prisoners.

The establishment of Fredet at Brignoud, which began operation in 1868 as a paper mill, has been greatly expanded during the war. Recently, a large addition has been made for the bleaching of cotton from rags. This has been used as a raw material in the manufacture of high explosives. Four 1 500-h. p., calcic-carbide furnaces are in operation, and several much larger furnaces are approaching completion, as is also a plant for the manufacture of cyanamide. In design and construction, the newer buildings of the Fredet establishment and their equipment are in every respect admirable.

In the Valley of the Romanche, the Société Electrothermique Keller-Leleux is installing a power plant which will utilize in one step a fall of 1 100 m. The diameter of the pipe is 50 cm.

Another development of interest is the manufacture of iron pipe by electrolytic deposit of iron on revolving cylinders.

In the vicinity of Grenoble, factories exist for the manufacture of caustic soda, chlorine, aluminium, carbide of calcium, cyanides, nitric acid, ferro-alloys of many kinds, magnesium, sodium peroxide, explosives, chlorates, cyanamide, and nitrogenous products. Before the war, about 90 000 h. p. was used in producing aluminium. In June, 1918, carbide of calcium was produced by a group of factories using 42 000 h. p., and producing about 45 000 tons per annum. Nitrogenous products, including cyanamide, were being produced at a rate of 4 000 tons per annum. Plants manufacturing shells, cartridges, military wagons, and other material for the French Army, were employing 25 000 hands and using 20 000 h. p.

The stimulus of war conditions is said to have resulted in the development of a method of enriching the flame produced by the local coal with a spray of heavy oil, thus solving the problem of utilizing for metallurgical purposes the coal of the region, which is far from being rich in volatile matter. It has resulted also in the installation of a considerable number of electric furnaces.

The time available to the Delegation did not permit a visit to the region of the Pyrenees. The impetus toward water-power development has been felt in this region, and several important plants are now in operation, including one of approximately 20 000 h. p. and another of 32 000 h. p. The Committee was informed, also, that two projects are under way in that region, which will use for transmission purposes a potential of 120 000 volts, though the highest hitherto used in France is 60 000 volts.

The third water-power district, as has been said, is that of the massif of the south central part of France. This region is extensive in area, and there are a number of streams of high aggregate fall, but these

streams are not large, and the power possibilities of the region are by no means comparable with those of the Rhône.

In the years immediately preceding the great war, the annual consumption of coal in France was something over 60 000 000 tons. Of this amount, approximately one-third was imported. The average price then was from $5 to $6 per ton. It is probable that in the future the price will be materially higher, probably about $8 per ton. It is obvious, therefore, that France should develop her water power as rapidly as practicable, since the great lack of the country is coal.

The Engineering Congress at its session in March last adopted recommendations looking to the standardization of frequency and voltage. It was recommended that 50 cycles per sec. be adopted as the standard frequency, and that the use of 25 cycles per sec. be permitted in special cases.

Although the Orleans Railway Company began in 1900 the operation of trains by electric locomotives between the Austerlitz Station and the Quai d'Orsay, and the Western Company in the following year electrified its line from the Invalides Station, Paris, to Versailles, comparatively little has been actually accomplished toward the further electrification of the railways of France. Careful studies by the engineers of several of the railway companies were in progress before the war, and it is expected that they will be resumed in the near future. We were informed that a commission representing three of the French railways will visit the United States in April and May, 1919, for the purpose of investigating the electrification of railways as developed in this country.

In general, French factories are equipped to construct all the electric machinery and apparatus which may be required, except, perhaps, certain electric railway equipment and turbo-alternators of the larger sizes, and even as regards these it would seem necessary only to add to the tool equipment of their factories, as there can be no question of the skill of their engineers and designers.

As regards water power legislation, France is in a position to-day very much like that in which we in America find ourselves. A general water power bill is before the House of Deputies. In view of the present realization of the importance of water power development, it is expected that a general bill governing water power concessions will be promptly enacted, and that its provisions will be attractive to capital. Hitherto, water powers have been developed either under governmental authorizations which are revocable, or under special concessions for a fixed term. In general, the terms of the concessions have been more favorable to the investor than those advocated by the so-called conservationists in the United States. While the authorizations are revocable, we are informed that revocation has never occurred

in France in a case where the parties authorized to undertake the development have proceeded in good faith to carry out the project.

The report of M. Barbet, General Secretary of the Congress, made to the final general meeting of the Congress of Civil Engineers, on January 4th, 1919, which is printed in Appendix II of this report, contains a résumé of the activities of the Congress in respect to water power to that date.

The visit to Grenoble and its vicinity followed the meeting referred to, and following the return of the Delegation to Paris, on January 11th, a final meeting of the Water Power Committee was held, at which the subject of hydro-electric development was further discussed. In the course of this discussion, members of the American Delegation emphasized the views expressed in the "Preliminary Report" (see Appendix I of this report), in regard to the importance of adopting and adhering to a standard frequency, and, as far as practicable, certain standard potentials of transmission and distribution of power. They also emphasized the importance of considering the development of auxiliary steam-driven electric plants in mining districts, and connecting them by electric transmission with the water power district of the Upper Rhône and the "Massif Centrale", for the purpose of converting into power, available throughout the year, the large amount of hydraulic power now available in these districts during a considerable portion of the year, but not for twelve months.

Committee on Roads

The Road Committee had a number of meetings with the corresponding French Committee of the Congress. That Committee consisted of six members, with M. Henry Heude, a retired Inspector General of Bridges and Roads, as Chairman. M. Heude is also a Professor in the Ecole des Ponts et Chaussées. The other members were either road engineers or prominent citizens especially interested in road improvement. Road building in general was discussed at great length, especially in its relation to present conditions in France. The French engineers stated that the problem was much simplified by the fact that their present system had been constructed with substantial and well-drained foundations, so that the existing roads with slight adjustments would serve as excellent foundations for new wearing surfaces, and that the selection of the type and method of construction of the wearing surface was the principal thing to be determined.

In this connection, the French Committee submitted to our Committee for consideration the following as the conclusion it had reached after much deliberation and study of the papers which had been submitted at several International Road Congresses:

1st.—Broken stone road surfaces, which have met with great success in the past, when exposed only to travel of the horse-drawn vehicles, have been found to be unsatisfactory for modern vehicles of heavy weight and great speed. For this reason, this method of construction must be given up for all road surfaces carrying any large amount of travel.

2d.—In more recent years, broken stone surfaces have been constructed, in which the stone is cemented together with asphalt, tar, or bituminous binders.

It was brought to the attention of engineers at the Road Congresses of Paris, 1908, Brussels, 1910, and Paris, 1913, and there is already a large amount of literature on the subject in various forms, as Government reports and in engineering journals.

Among them is the system of surface application of bituminous materials, but these have been generally insufficient and proved only palliatives against dust.

A most satisfactory surface is known as asphalt macadam, in which the broken stone is bound or cemented together by asphalt, native or artificial, penetrating the surface of the stone after it has been spread on the road, or by coating the stone with asphalt before it is applied to the surface.

The penetration system has been found to be most satisfactory, since it involves no great expenses for plants, as is the case in the mixing method. The broken stone is placed in the road, the asphalt poured on it in a melted condition, and the mass compressed with a roller; stone chips are then introduced into the surface and thoroughly rolled. A seal coat composed of a filler and a certain quantity of asphalt is then added and rolled after the application of fine mineral matters to complete the surface.

In another method of construction, the stone is mixed mechanically when warm and dry in a mechanical mixer with a definite quantity of asphalt. This involves the use of a more or less expensive plant and increases the cost. The coated stone is then hauled to the road, and spread and compressed in the same manner as in the penetration method. The more elaborate method of procedure in the latter case, of course, increases the cost. Experience extending over 10 years has demonstrated in the United States the ability of such surface to withstand heavy travel for 10 years or more, if carefully constructed, the latter point being essential.

The highest type of asphalt surface is that constructed with a mineral aggregate of sand of a very fine nature, to which a proper quantity of dust is added and, when it is hot, a proper quantity of asphalt to bind the mineral aggregate together.

Eventually, under the conditions existing on main arteries, it is evidently the latter form of construction which is the most desirable, owing to its longer life, if its construction could be financed and if it is properly maintained. The construction of surfaces of this type—sheet asphalt—has been studied with care for many years, and there is extensive literature in regard to it.

Asphalt surfaces have been constructed in every climate from Canada to Cuba with equal success, and from the cold and rainy

climate of the Northeastern United States to that of California, which is dry.

3d.—Road surfaces of Portland cement concrete have attracted attention for many years. They are of particular value in the neighborhood of plants which manufacture the cement, in consequence of which the material is cheap in their construction. The skill required for the production of good concrete is most essential, but large areas of surface of this type have been constructed in recent years. The concrete possesses the advantage that if laid at a proper grade it can be used as a foundation for all the types of roadways after its original utility has gone.

4th.—Road surfaces of vitrified bricks are serviceable when the bricks are of the best character, but only in regions where suitable clays for their manufacture are available and where brick plants are in existence. They are much more expensive than the types which have been previously mentioned and can hardly be considered in the problem of road construction in France.

On these conditions, one cannot expect the Communes, the Departments, and the State, to find immediately after the war the necessary capital. The old system must be entirely given up. Consequently, the extremely useful work of repairing our road system can only be done through the medium of private enterprise which would find the capital, enter into agreement with the Communes, the Departments, and the State, and undertake the construction of some well determined portion of road, guaranteeing the maintenance of the same during a certain number of years, an annuity including the former yearly price of maintenance, increased by the present greater value, and even of an excess if justified by the improvement being provided for. It will be then advisable to ask the American engineers how the road budget problem has been solved in America, and to examine in what proportion we could apply in France the American solution.

To these our Committee made this reply:

Referring specifically to the tentative conclusions of the French members of the Committee, submitted at the first meeting held on December 20th, 1918, the American Delegates would say as regards methods of construction:

1st.—That they heartily agree with the proposition that broken-stone roads have been found to be unsatisfactory for motor vehicles of heavy weight and great speed, and that, consequently, this method of construction should be given up for road surfaces carrying a large amount of traffic. This conclusion has been reached in America, and what is known as water-bound macadam is sometimes used, but only where a temporary roadway is required.

In arriving at this conclusion, the American Delegates wish it to be clearly understood that they recognize fully the value of these water-bound macadam roads during the recent war; that, while they did suffer materially under a heavy traffic, their character was such that repairs could be quickly made, and the roads kept in almost continuous use. This, of course, was expensive, but, in times of war, quick results are necessary, rather than economy, and construction

methods are perfectly proper and justifiable that would be very extravagant in times of peace.

2d.—That they fully agree with the conclusion that surface applications of bitumen to broken stone surfaces have not been satisfactory for heavy traffic, but that a more satisfactory surface known as "asphalt macadam" can be constructed by what is known as a "penetration" system, and that it can be laid in the way referred to so that good results can be obtained. In the construction of bituminous concrete pavements, a much more elaborate plant is required, which naturally makes the cost of the road surface more expensive. It is probable, however, that the extra cost is justifiable on account of the greater durability of this class of pavement.

In the memorandum it is stated that experience has demonstrated that this kind of pavement will stand heavy traffic for ten years or more, if carefully constructed. The American Delegates think this is a rather optimistic view. It depends, however, on just what is considered "heavy traffic". The word "heavy", as applied to traffic, is a very indefinite one, for with the increased weight of trucks that have been in use during the last two or three years, what would have been considered heavy traffic five years ago would be medium traffic at the present time.

3d.—The statement that the highest type of asphalt surface is that constructed with a mineral aggregate of sand of very fine nature, to which a proper quantity of dust and asphalt is added, is undoubtedly correct for a city pavement. It is, however, exceedingly doubtful if such a pavement would withstand the heavy units of motor traffic that are in use at the present time and likely to increase in the future.

4th.—That, as to the use of brick for road construction in France, they feel some hesitancy in making any recommendations, as they are unfamiliar with the character of shales and clays in France.

The American Delegates were asked for an expression of opinion as to the methods of financing road improvements in France, and the possibility of inducing private companies or contractors to undertake such work, receiving their compensation in a number of annual installments, fifteen such payments having been suggested.

It is probable that there are American companies or contractors who would be ready to finance road improvements with their own funds and accept payment in a number of annual installments—provided they are given entirely satisfactory guarantees of payment. It must be pointed out, however, that they would be obliged to borrow the money, thus paying a higher rate of interest than the State, and that they would expect a larger profit and a good rate of interest on all their carrying charges—so that the amount of work done for the same total expenditure would be much less than if they received prompt payment in full and release from their obligations. The credit of the State would be better than that of the private companies, and it would seem that it should be availed of, in order to secure satisfactory results with a minimum of expenditure and in the shortest possible time.

Special attention was called to the folly of providing funds for road improvement by the issue of long-term bonds, running for a

period far longer than the life of the road surface, specific instances being given to show how costly such policies had proven. The plan of imposing assessments for the benefit of such improvements, so frequently followed in America, more particularly in cities, and the apportionment of the cost of the work between State, county and town, were described in considerable detail.

Our Committee also presented the following memorandum relative to American practice:

During the last few years in the United States the material used in road construction has been principally bitumen in its various forms, cement, concrete, and brick. The different methods in which bitumen has been used are known as the bituminous concrete pavements and bituminous macadam pavements.

A bituminous concrete pavement is one composed of broken stone, broken slag, gravel, or shells, with or without sand, Portland cement, fine inert material, or combinations thereof, and a bituminous cement incorporated together by a mixing method.

A bituminous macadam pavement is one having a wearing course of macadam with the interstices filled by a penetration method with a bituminous binder.

Bituminous concrete pavements are sometimes divided into three classes:

Class A.—A bituminous concrete pavement having a mineral aggregate composed of one product of a crushing or screening plant.

Class B.—A bituminous concrete pavement having a mineral aggregate composed of a certain number of parts by weight or volume of one product of a crushing or screening plant, and a certain number of parts by weight or volume of sand, broken stone screenings, or similar material, with or without a filler.

Class C.—A bituminous concrete pavement having a predetermined mechanically graded aggregate composed of broken stone, broken slag, gravel, or shell, with or without sand, Portland cement, fine inert material, or combinations thereof.

Sometimes, when a water-bound macadam pavement has been laid for some time and requires improvement, a thin coat of bituminous material is spread over the surface. While this cannot be considered a permanent construction, it has been used to quite an extent on light traffic roads with good results. It is especially good as a preventive of dust.

Which of the above kinds of pavement are to be used in any particular case must be decided by conditions, the principal ones being traffic, first cost, cost of maintenance, life of the pavement, and the availability of the material.

In considering the traffic, there must be taken into account, not only the volume of traffic, but also the units of traffic. It will be easily understood that 10 000 tons of traffic in units of 10 tons will

injure a pavement more than the same amount of traffic in units of 1 ton. In the former case, the pavement must be given a solidity that will sustain the heavy units.

In considering the matter of cost, it must be remembered that first cost is not the only item that makes up the ultimate cost of the pavement, but that the cost of repairs must be carefully considered. Very often a pavement, the first cost of which is great, will be less expensive in the long run on account of the lesser cost of maintenance. It is easily understood, of course, that the longer the pavement will last, the cheaper it will be as a general proposition. It must also be remembered that certain materials, like bitumen, have a certain durability irrespective of traffic, while others, like stone, for instance, are worn out or destroyed only by traffic.

The availability of material is always an important consideration. It would be useless to think of a material for road work, which is at so great a distance from the point of use that the freight charges would make it too expensive. Often a poorer material should be used when, theoretically, a more expensive and more durable one would be advisable.

Although it was stated at one of the meetings of the Committee that conditions were such in France that brick and cement concrete could not be used to advantage, it was thought best by the American Committee to furnish information regarding these roads to the French Committee.

The Committee, too, would suggest a further trial of cement concrete for road work. It must be remembered that when any new type of road is first used, errors are apt to occur in construction, which give bad results, and, at first glance, it would seem to reflect on the material used, when, as a matter of fact, the trouble is in the method of construction. The character of cement concrete roads in America has been improved very much during the past five years, as a result of which large quantities are being laid in practically all the States doing road work. With the natural tendency of the French engineers to work carefully and to achieve good results, it is thought that possibly if another trial is given, taking into consideration American practice, results may be achieved that will be more satisfactory than in the past.

Brick roads have been used in the United States to a great extent, and very satisfactorily. In many portions of the country, stone or other paving materials are extremely scarce, and where a clay, or a clay mixed with shale, can be obtained that will produce a good paving brick, such pavements can be laid with satisfactory results.

If, in France, clays or shale can be obtained that will produce brick that will stand the specifications provided for American brick, there ought to be but little fear in their use. It must be understood distinctly, however, that the brick must be good, in order to produce good pavements.

At a meeting held on January 3d, our Committee submitted numerous documents descriptive of the practice of road construction in the United States, and the manner in which road improvement is

financed. These consisted of forms of contracts and specifications of the New York State Highway Department, covering the construction of all kinds of roads built in that State, a copy of the "Final Report of the Special Committee of the American Society of Civil Engineers on Materials for Road Construction and Standards for Their Test and Use", and proof sheets of several sections of the "American Highway Engineers' Handbook", then in press, containing exhaustive descriptions and discussions of materials and methods, as well as the manner in which such improvements are financed in rural and urban districts.

After an exchange of views, the following conclusions were unanimously adopted and presented to the Congress:

1. Broken stone roads, which formerly were deemed suitable even for city streets, are soon damaged by motor vehicle traffic, to which they are not adapted. The tarring, which has mitigated the nuisance from dust, only very insufficiently preserves the road surface from the wear and tear due to the travel of vehicles with mechanical traction.

2. New systems of construction have been developed, the most successful, perhaps, being cement concrete and bituminous and brick surfaces. Experience extending over a sufficient number of years, has shown that the preference to be given to one or the other of these various systems of construction depends on several factors: climate, intensity of travel, cost price, etc. The brick surfaces used in America could only be used in exceptional cases in France. Cement concrete roads are only advisable in countries where the materials used in their composition are at hand at advantageous prices.

3. Roads constructed with bitumen or asphalt aggregates are, unfortunately, very expensive, but they have the advantage of requiring less maintenance than broken stone roads. For an equal travel intensity, they answer much better the exigencies of the travel of motor vehicles.

4. The cost of laying these roads is considerably lowered when this system of construction is applied to broken stone roads, the old broken stone constituting a good foundation.

5. The reconstruction of the French road system is necessary on account of its great deterioration due to the travel during the war. It would be folly to restore this system as it was before, as it could not withstand the traffic of motor vehicles, which will grow rapidly to meet industrial and commercial requirements, as well as those of tourists, and the expense of maintenance of broken stone roads would greatly increase without giving satisfaction to those who use them. Happily, most of the French roads will make excellent foundations to which it will be sufficient to apply appropriate wearing surfaces. Under these conditions, it will be possible to adapt the roads to the new requirements without incurring very great expense.

It would be logical that the expenses relative to the improvement and maintenance of the roads should be borne by those who use them, and the abutters who profit by the travel. This principle, admitted

and applied in some foreign countries, permits the issue of bonds for the improvement of roads, the capital being guaranteed by taxes and revenues which are certain and which increase with the intensity of the travel, as, for instance, taxes on motor cars, on gasoline, etc. Unhappily, the fiscal laws in force in France do not allow this procedure, and, as it is not possible to count on voluntary contributions, it is necessary to have recourse to the budget of the State, "Departments", and "Communes", in order to obtain the necessary allowances to bring the road system to a state capable of meeting the new requirements.

If, however, the State, "Departments", and "Communes" could not find the necessary capital, private enterprises might be organized to undertake the construction of some well defined portions of roads, guaranteeing their maintenance during a certain number of years, with the proviso that an annuity, including the old yearly price of maintenance increased to cover the new conditions, and a further sum representing the value of a prompt realization of the benefit of the improvement, should be provided, in addition to the cost of construction.

Though this proceeding may be more expensive than direct construction through the Public Works, it will be necessary, perhaps, to have recourse to it, on account of the circumstances created by the war.

The study of the financial question must be pursued in subsequent discussions, with the co-operation of persons qualified to give useful advice.

Agricultural Industries and Rural Hygiene.

This section, under the chairmanship of M. Risler, discussed and compared French and American experiences and viewpoints concerning topics set forth at length in the Proceedings of Section VII of the Congress of March, 1918. Much information is also to be found on financial, organization, hygienic, and public welfare questions in the work of other sections, particularly Sections VIII, IX, and X.

The French members summarized these papers, explained the prevailing viewpoints of last March, and supplemented them with later data and views in three reports as follows:

1. Organization of an Agricultural Bank, by M. F. Mainié.
2. Agricultural Industries in France, by M. E. Barbet.
3. Agricultural Equipment and Rural Hygiene, by Capt. G. Coupan.

Banking Facilities.—In France there has existed for many years a law whereby the National Government has provided loans to small farmers effecting a co-operative association. Such loans have not been especially popular, and it is considered that the laws are too restricted to allow French agriculture now to secure the working capital needed to meet the demands which the war has placed upon it.

Fortunately for France, its farming lands are mortgaged only to a small extent. It is believed that laws should be adopted, whereby long-term loans can be made safely and conveniently on the basis of

transferable mortgage bonds, that is, coupon bonds placed on the market under proper Government supervision, preferably by an agricultural bank.

Industries in France are handicapped by short-term loans being limited to 90 days, the period for which time deposits are made in the French banks. In most cases, notes can be renewed, but the uncertainty is a handicap, especially to the French farmers who need loans for a year or even longer, in order to raise their products and market them to advantage.

French banking laws need bringing up to date in this respect and particularly with reference to chattel mortgages on movable property. The obligation, by tradition, if not by law, to place the pledged property in the hands of the creditor, makes an awkward situation to deal with in many instances. Certain mills, sugar factories, fertilizer companies, etc., have made some headway in the face of old-fashioned laws and customs relative to the hypothecation of personal or movable property; but the French laws on registration of such mortgages are not as favorable as modern business methods provide.

Government warehouses issue receipts but, generally speaking, receipts, or certificates of ownership of goods in storage or transit, are apparently not issued in suitable form for convenient use as collateral pledge at the bank.

American banking laws, customs, and procedures were explained in practical terms at some length. In particular, a synopsis was given of the Farm Loan Act adopted in the United States in 1916, and the means provided through regional banks for disposing of farm bonds to the investing public.

Rates of interest charges in the United States were discussed, and attention was given to the question of commissions paid to those banks authorized to sell farm bonds approved by the Government.

The French members called attention to the great success attending the sale of short-term bonds of the French Treasury. About 1 500 000 000 francs of these bonds are sold monthly. It is proposed that an agricultural bank be established to issue similar obligations which it is believed would be well received by the French public. To aid such an agricultural bank in developing agriculture and associated industries, it is understood that the Bank of France would place at its disposal about 20 000 000 francs annually.

As a part of the proposed French National Bank of Agriculture is included an advisory council with a staff of engineers, agricultural specialists, business men, implement operators, and publicity men to explain the benefits of the improved arrangements for the regeneration of French agriculture. These advisers would cover the fields of rural hygiene and public welfare of the farming districts and guide the farmers as to needs of foreign trade.

In this connection, it is well to bear in mind the vast number of holdings into which French farm lands have been subdivided. This results from the cessation, since the days of the French Revolution, of the law of primogeniture, and from the adoption, years ago, of a law prohibiting the disinheritance of a child to an extent of more than 50% of his heritage. Naturally, this has built up a nation of property owners, strikingly conservative and individualistic in their views, who are, as a whole, loath to leave old paths for new ones.

Agricultural Industries.—Attention was called to the fact that France possesses only 12 cold storage plants (all recently built) for the storing of meats and 100 refrigerator cars, while in the United States there are about 20 000 cold storage plants and 100 000 refrigerator cars. The practice in France has been to slaughter in a small way in each town and village and to sell immediately the meat for consumption. The French members thought that this practice was wrong, and that the cattle should be slaughtered in the localities where it is raised, and that the meat should be shipped to the places of consumption, there to be stored in cold storage plants and to be sold from these plants. It was thought that the rebuilding of the devastated sections of France would be an excellent opportunity to put this practice into effect, and that ways and means should be devised with a view to copying the American system of handling meat.

A new method was explained of concentrating grape juice. The concentrated juice reduces the bulk four-fifths, which would be an important factor in the matter of storage and shipment. Inasmuch as the importation of wines into the United States will be prohibited on July 1st, 1919, new methods of producing concentrated grape juice may be of interest to Americans. An instance was cited of grape juice which was brought from Algeria to Nantes, where it was passed through the concentrating process. It was then diluted with water and fermented, experts pronouncing it as having the same properties as wine. The concentrating process expels all parasitic growths on the grape and purifies the juice, which can be produced either in the form of a jelly, almost solid, or of a syrup. The juice is sterilized in this treatment, and fermentation can proceed, depending on the cultures of wines desired and used, in accordance with the teachings of the illustrious Pasteur.

It is hoped by those having this matter in hand that beneficial results will come along several lines as follows:

It should provide, with a suitable set of revised taxes, a means of export which will of itself secure a market for a substantial portion of the entire output of grape juice. It should enable storage of portions of the yield of years of superabundance for making up the deficits of years of poor grape yields. Further, it should promote a wider adoption

of a rational fermentation procedure, tending to lessen the proportional output of indifferently fermented wines.

What has been said of wine, as to variable output in quantity, is still more true of cider which shows a range of ten to one between maximum and minimum output, for example, the years 1917 and 1918. It would have been of marked advantage in 1918 to have had concentrated apple juice from 1917, when the fruit was so abundant that one did not know what to do with it.

The drying of fruit and vegetables on a large scale is an industry which has been scarcely undertaken in France, although considerable progress has been made in America, especially with the dried fruits of California.

Agricultural Equipment.—In round numbers the available data indicate that, in 1914, the total value of French farm machinery was between 4 000 000 000 and 5 000 000 000 francs. The pre-war imports are placed at about 100 000 000 francs annually, which is also the figure given by some estimators for the value of the French output of farm equipment. Others consider the latter figure to be too low, and believe that 150 000 000 francs is a fair yearly figure for French production in the past, if regard is paid to hardware and metal work on carts, harnesses, etc. With the imports, this makes 250 000 000 francs as the annual consumption of farm equipment.

Capt. Coupan, Engineer of the French Ministry of Agriculture, requested that announcement be made in America of the pressing needs of the invaded area for farm equipment, for which his recent estimates, with comparisons of the normal annual output of French factories, are as follows:

51 000	Double Belgian plows
20 000	Plows with a fore-carriage
13 000	Plows with several wheels
56 000	Scarifiers and tillers
88 000	Harrows
50 000	Rollers
48 000	Grubbing spades used with horses
16 000	Beet-pullers
36 000	Sowing machines
13 000	Fertilizer distributors
34 000	Mowing machines
18 000	Rakes used with horses
21 000	Hay spreaders
8 000	Harvesting machines
24 000	Binding machines
114 000	Vehicles (different kinds)

12 000 Threshing machines (used with horses; inclined plane system)
8 000 Threshing machines used with motors
3 400 Threshing machines for work on a large scale
40 000 Weighing machines for grain
9 000 Self-binders
53 000 Root-diggers

without counting the stone crushers, straw-cutters, pumps, motors, harness equipment, horse-shoes, string for binders, etc.

We can form an idea of what these immediately required implements represent, by comparing the previously mentioned figures with those corresponding to the annual average production of our factories during a few years immediately preceding the last war:

Double Belgian plows	40 000
Divers plows	200 000
Tillers, harrows, rakes	150 000
Rollers	50 000
Fertilizer distributors and sowing machines	18 000
Mowing machines	10 000
Harvesting and binding machines	3 000
Divers materials for threshing machines	3 000

The requirements in some cases exceed the former annual producing capacity of France, which is now reduced about one-third, due to destruction of factories.

In the uninvaded districts of France, it is estimated that more than 50% of the agricultural machinery, owing to lack of repairs and spare parts, is either worthless or in need of extensive repairs.

To what extent Germany can make reparation in kind to help supply equipment to farmers in the devastated area is not now known. The French Government through special bureaus is taking steps to purchase new equipment, with certain appropriations already available, and charging deliveries against a portion of a farmer's estimated indemnity.

French farmers have demanded a wide variety of types of machines, and hitherto French manufacturers have conformed to such wishes. There is a great need of modern methods of standardization, both for types of machines and individual parts thereof. French engineers appreciate this in the interest of economical quantity production. They will encounter resistance from the French farmers, who have strong individual preferences, but now is the time to overcome it.

Some of the French munitions factories will undoubtedly take up the manufacture of farm machinery. Imports at the outset may be helpful in some measure, but, with few exceptions, such as threshers, etc., it is

the view of the French members that the equipment can and should be made in France and adapted strictly to French requirements.

Much is expected of the proposed Agricultural Bank in facilitating this branch of French industry. Some believe that American manufacturers by associating with French makers of farm machinery could work out arrangements that would be mutually advantageous. American experience with some phases of quantity production could probably help the French for a time. Each case would have to be considered on its own merits, as is true of the financial aspects of the proposition. Here, it is to be pointed out that the present French law is understood to require French control to the extent of at least 66⅔% of the securities of concerns in which foreign capital is interested.

The American members were not able to offer much hope for the general use of electricity in rural districts, in competition with combustion engines. As for electricity for heating and lighting in the rural districts, that is a question of economics to be studied on the basis of sound local data for each district.

The French members hope that the proposed Agricultural Bank will be of substantial aid in developing the fertilizer trade with a phosphate rock in Morocco, potash salts in Alsace, and with acid and nitrogen plants built during the war, the latter near the hydro-electric plants of the French Alps.

The French are well informed on scientific agriculture, and the only topic mentioned at the meetings was the work of Whitney on antiseptic treatment of soils to destroy the toxines produced by plant life.

Rural Hygiene.—This is largely a question of popular practical education in the rural districts of France, as is the case in other countries. The French members know well what ought to be done, and steps are being taken systematically to stimulate interest in modern sanitation in the farming districts.

Pamphlets of instruction and advice have recently been prepared by the Association Générale des Hygiénistes et Téchniciens Municipaux, through a committee headed by Col. Bechmann, for 27 years Chief Engineer of the Water Supply and Sewerage Departments of Paris.

Educational methods in vogue in America, especially the efforts of States to accomplish results through conventions of health officers, school teachers, public health associations, etc., were explained. Further data in this respect will be furnished by the American members.

The general welfare and comfort of the farmers and their families was also discussed along the line of moulding public opinion through numerous popular local leaders who are appreciative of local conditions and means of remedy.

The present is peculiarly a fitting time for conducting educational campaigns for making living conditions among the French peasants safer and better. The local press, local schools, and local leaders throughout France should be stimulated on these lines.

A memorandum outlining the news of the American members on the topics previously outlined was prepared and handed to the French members early in January, substantially as follows:

1. Working capital for farmers, to permit them to purchase required mechanical equipment, animals, fertilizers, seeds, etc., should be obtainable from the sale of long-term farm bonds, founded on safe mortgages of sufficiently large co-operative groups of farms, granted under adequate supervision and guarantee of the National Government, with the banks selling such guaranteed bonds given a reasonable commission so as to make it to their advantage to popularize such guaranteed bonds among the investing public.

2. Safe and convenient procedures, with standardized blank forms, for establishing chattel mortgages on movable property, should be provided so as to afford satisfactory collateral or pledge to banks authorized to make loans to the owners for prospective purchases of such property, including industrial equipment, crops, agricultural products, merchandise, etc.

3. A comprehensive and convenient system of warehouse receipts, bills of shipment or lading, acceptances by commission houses, and other documentary proofs of the movements of merchandise in transit from their points of origin to points of destination and payment, should be devised under suitable Government supervision and protected by adequate insurance against loss, so that such records of property may be safely accepted as collateral by banks authorized to make loans to their owners.

4. With amendments made to banking laws so as to permit the convenient hypothecation of property of various kinds, on which loans are sought for periods up to one year or more, it is necessary also to consider time deposits in bank for periods much in excess of 90 days, and to see to it that laws and decrees are formulated in a sound legal manner satisfactory to the banking interests proposing to operate under them.

5. The manner and extent to which the supervision credit and guarantee of the Federal Government of France is pledged to the protection of money lenders should be published in a very clear manner. Likewise, the advantages of ample working capital should at once be made plain to the French farmers, so that they will not be handicapped as compared with farmers of other nations in storing and preserving their products for advantageous sale at home or abroad, in ways which should be given full and wide publicity.

The foregoing suggestions are based on practical experience in America. They deal with certain principles which it is hoped may be of benefit in modifying French banking facilities. Obviously, it is out of the question to attempt here to detail further a subject which is so intimately related to existing laws and decrees in France.

Mechanical equipment for French farmers should be adjusted to the soil, climate, customs, and preferences of France and the countries to which it proposes to export agricultural implements. In adapting munitions and other plants to their manufacture, great effort should be made to standardize types of machines and equipment, and of all parts thereof, so as to facilitate quantity production and thus to secure the resulting economies.

France could adopt to its advantage American methods of establishing in various cattle-raising districts modern slaughter houses and cold storage plants for all meat products. The same is true of a certain number of refrigerator cars for transporting such products from the rural districts to the larger cities. This will require modification of laws and the establishment of effective sanitary supervision of all the branches of this industry, including the central markets.

The drying of fruits and the concentration of fruit juices for shipment and for stabilizing the wine industries are steps worthy of most careful development.

Storage of farm products in metallic containers on the farm and the establishment of central silos or grain elevators of concrete are American customs which seem applicable for use in France, particularly in the devastated area, and at a time when a change to new customs is easier than ordinarily. With central storage plants, there should be established a system of official inspection and classification as to quality of produce received, with receipts issued in such a way as to be usable as collateral or pledge at the banks.

Fertilizers and soil disinfectants, especially potash salts from Alsace, should be quickly industrialized for export, and be exploited.

The reconstitution of French agricultural methods, in so far as this can be undertaken to advantage, should be decided on as quickly as possible during the present period of general commercial readjustments. Great aid would follow the wide publicity through Government channels of details of recommended changes in procedures and the reasons for their adoption.

Should co-operation be desired from America along any lines, it is best that each specific case be dealt with separately. American capital in substantial sums is not likely to come to the aid of French agriculture, except under conditions satisfactory to American bankers and doubtless on the recommendation of American engineers.

Commercial organizations to exploit American methods in France should give due consideration to using, for a time at least, American supervision, so as to teach the details to French associates.

In France, as in America and other countries, hygienic conditions among the farmers are not as favorable as in the cities. This is due to ignoring well known public health teachings in relation both to personal hygiene and community sanitation. It can be corrected only by persistent and systematic campaigns of publicity through the aid of practicing physicians, health officers of communes, school teachers, and influential citizens, and particularly of the local press, all of whom can advantageously be guided at district conventions conducted by the National Health Council. It is well to remember that the transmission of disease by flies may be a much more serious factor in the future than before the war which has brought millions of foreign troops to France.

Rural welfare movements to increase the comforts of farm life are well worth while, and publicity campaigns to that end should follow similar lines to those suggested for rural hygiene, all with the view of securing popular and effective local leadership for moulding public opinion.

Committee on Technical Education.

This Committee held three meetings—on December 21st and 23d, 1918, and on January 15th, 1919. Views were exchanged with reference to a variety of subjects and, in general, the French engineers and the American delegates were in agreement.

The French system of education is quite different from the American system. All schools, both public and private, in France, are under the control of the Ministry of Public Instruction, and under the supervision of a council and a corps of inspectors. The so-called "primary" schools take the children up to the age of 13. Instruction is obligatory for all children between the ages of 6 and 13. The so-called "primary superior" schools take children from 13 to 16. The so-called "secondary schools", attendance of which is not obligatory, take children from the ages of 13 to 20. This instruction, general in character, is followed by the strictly professional education in the polytechnic schools and universities.

Graduates from the engineering schools in France are on the average older than in the United States. They have received admirable theoretical and general instruction, but probably they have received less technical and practical education than in the schools in the United States.

It was the opinion of some of the French engineers that the technical education was too general and theoretical, and that the course was completed too late. In this, the American engineers held the same opinion.

The opinion was also expressed by the French engineers that the teaching of general studies and sciences in the technical schools should be practical and directed to the needs of the engineer. The instruction in mathematics should not be abstract and theoretic, but practical and concrete. The same is true with regard to instruction in languages and other studies. This tendency is the same that is observable in many of the schools of the United States, and they were heartily approved by the American representatives.

The French are much concerned in the problem of training apprentices. The trades and technical occupations should, as a result of the war, attract an increasing number of young men who need manual training and practical instruction in the shop in the various trades. The object should be to give such vocational instruction as would select the right young men for the occupations for which they are naturally fitted.

Apparently, the French are doing more in training apprentices in public schools than we are doing in the United States.

The French engineers fully realize that after the war the problem will be to bring about as large a production as possible, accompanied by increased efficiency. The subject of efficiency in industrial establishments is occupying a great deal of attention in France. The works of the late Frederick W. Taylor are widely quoted and used. Instruction is given in some of the schools in reference to this subject.

Technical instruction in France is confined to the secondary and superior schools. As for the secondary schools, where the students range from about 13 to about 20, the French engineers express the opinion that the instruction should be more specialized, though not too much so, and that the attention of students should be directed toward industrial questions, with the object of provoking early the recognition of industrial pursuits and directing into such pursuits such young men as are qualified.

It was considered necessary to introduce some manual training into such schools.

There was much discussion with reference to the proper location of technical schools. In France, such schools are generally located in the closely built portions of the city, and little attention is paid to physical exercise, play, games, or athletics. The engineering schools also are located in the same manner, and their quarters are frequently so cramped that extension is impossible. The American engineers urged the importance of having technical schools and universities located in or near the suburbs of the cities, where extension was possible and yet where contact with industrial establishments could still be had. The French engineers seem to appreciate the importance of this matter.

There was considerable discussion with reference to methods of instruction, number of students in classes, the necessity of rigorous

discipline rather than freedom of students, the benefits of conferences with professional engineers, etc.

One of the most important points discussed had reference to the exchange of students and teachers between the two countries. The American delegates pointed out the fact that in the past the French schools had not offered as many attractions to American students as the German universities. Many of the most eminent scientists in America have studied for a longer or shorter time at German universities. Such men are found in all branches of pure science, in law, medicine, history, economics, and engineering. Probably there have been fewer in engineering than in pure science, because, although pure science is the same everywhere, the method of application may differ greatly in different countries, and the methods in use in one country may not be applicable in another. Nevertheless, there have been many American students at the technical schools of Germany and Switzerland, and comparatively few at the schools of France. The American delegates expressed the hope that in the future these things will be changed, and that young Americans who desire to go to Europe to study will be attracted to France. If this is to come about, however, the French must not be extremely rigid on small points, nor must they insist on precise equivalents or require rigid examinations.

The benefit that a young man gets from study abroad is often more from traveling, the knowledge of a foreign language and foreign people, general broadening of his point of view and sympathy, than from the precise details of knowledge.

It is in the highest degree desirable that young men from any country desiring to study in another, should be received hospitably, and that they be allowed to get what they can as long as they attend to their business. A young man who goes to a foreign country, well recommended from the schools in his own country, and with credentials which show him to be earnest and serious in his intentions, should be given free opportunity unhampered by precise requirements. A broad system of equivalents in studies should be recognized. It should be easy to enter a foreign institution, but once having entered, the student who is found neglecting his work or manifestly wasting his time, should not be allowed to continue.

L'Ecole Centrale des Arts et Manufactures, in Paris, was visited by the Delegation at the invitation of its President. Its class-rooms and laboratories, as well as the work of its students, were open to inspection. This school has always admitted Americans as well as other foreigners to its examinations, and those who passed such examinations with sufficient credit were entitled to admission just the same as French boys. This method, however, has not served to attract many Americans, for reasons already stated. A modification of the method is in con-

templation, by which a system of equivalents will be used, and it is hoped that this system may be adopted.

The American delegation assured the French engineers that the American universities would welcome any Frenchmen who desire to study in America and would offer them every opportunity to profit by such study, and that they believed that these universities would be reasonable and liberal in accepting as a preparation the work done in France. These views were received with approval by the French engineers.

It should be added that the French contemplate spending considerable sums of money in improving their technical schools, which, at the present time, as far as we are informed, do not offer the material advantages in equipment, laboratories, etc., that are offered by the best American schools. Many of the French professors, however, are most eminent; and the courses of study under some of these, even with less perfect equipment than we have at home, might well be of benefit to young Americans who desire some foreign study in completing their own professional courses.

The interchange of teachers or assistants for short periods was discussed, and the opinion was expressed that it ought to be encouraged if possible.

Altogether, the French and the American engineers were not in disagreement with regard to any of the essential points discussed with reference to technical education. It is to be hoped that the continuance of these discussions may lead to increasing co-operation between the two countries and increasing knowledge of each other.

At the last formal meeting of the Congress, President Millerand suggested the desirability of forming a permanent International Franco-American Engineering Committee, so that the engineers of both countries could keep in touch with each other, and by means of which specific problems could be discussed and co-operation promoted between the two countries. A formal vote was passed approving the formation of such a permanent committee. The members of the Delegation were asked if they would serve as the American members of such a committee. They replied that they could not accept this invitation, as they had not been appointed permanently by the Societies they represented, and that they would report to these Societies on their return to America and ask them to appoint members of a permanent committee. The Delegation was then asked if they would serve temporarily as the members of such a permanent committee, and this they consented to do.

The French members of such permanent committee were appointed, and consisted of the Presidents of the Sections of the Congress, and the General Secretary, all these gentlemen being the men with whom

the members of the Delegation had discussed the various problems which have been referred to in this report.

Immediately on its return to America, the Delegation made a report to the four Societies, reciting the action of the Congress with reference to the appointment of the committee, and asking the Societies to take action. This report is added as Appendix III to this final report.

This completes the statement of the discussions of the various topics presented to the Delegation.

It should be added that the Delegation was entertained most hospitably by the French Congress and by the French engineers, and that everything possible was done to make its visit pleasant and profitable. The members of the Delegation desire to express their appreciation of the many courtesies and hospitalities which were tendered to them.

Respectfully submitted by the Delegation,

GEORGE F. SWAIN, *Chairman**
JAMES F. CASE,
NELSON P. LEWIS,
GEORGE W. TILLSON,
GEORGE W. FULLER,
A. M. HUNT,
CHARLES T. MAIN,
L. B. STILLWELL,
E. G. SPILSBURY.

* As Maj. Case decided to remain in Europe, Professor Swain became Acting Chairman of the Committee.

APPENDIX I

PRELIMINAY REPORT OF THE AMERICAN DELEGATION OF ENGINEERS.

TO THE CONRÈS GÉNÉRAL DU GÉNIE CIVIL,
19 rue Blanche, Paris, France.

GENTLEMEN:—The Delegation of American Engineers which has visited France at your invitation, desire, before leaving for America, to submit to you a brief report, covering the questions which have been discussed with you and giving such of its conclusions and recommendations as it is able at the present time to formulate.

The Delegation was divided into six committees, corresponding essentially to your own committees. These committees were the following:

1.—*Committee on Commercial Ports.*—Messrs. James F. Case, Chairman, Charles T. Main, E. G. Spilsbury, A. M. Hunt.

2.—*Committee on Water Power.*—Messrs. Lewis B. Stillwell, Chairman, A. M. Hunt, Charles T. Main, George F. Swain.

3.—*Committee on Navigable Waterways.*—Messrs. George F. Swain, Chairman, James F. Case, Charles T. Main, E. Gybbon Spilsbury.

4.—*Committee on Roads.*—Messrs. George W. Tillson, Chairman, Nelson P. Lewis.

5.—*Committee on Technical Education.*—Messrs. George F. Swain, Chairman, Charles T. Main, Lewis B. Stillwell, E. Gybbon Spilsbury.

6.—*Committee on Agricultural Development.*—Messrs. George W. Fuller, Chairman, James F. Case, Nelson P. Lewis, George W. Tillson.

The Committee on Commercial Ports and the Committee on Navigable Waterways, however, were not separated in the conferences; so that, in reality, there were five committees.

The Committees have read so far as practicable the papers presented to the Congrès last March, have discussed the various resolutions there adopted, and have considered such other questions as were presented to them. The Secretary of the Congrès, M. E. Barbet, has prepared and submitted to you a careful and elaborate report of the proceedings in which we have taken part. At the present time, we cannot do more than refer to the conclusions and the resolutions passed by the Congrès in March, and to make such comments on them as seem proper to us after having listened to the discussions and visited the localities to which we have been taken.

COMMITTEE ON PORTS AND INLAND WATERWAYS.

The Committee has read the papers of the Congress held in March relating to the questions of Ports and Navigable Waterways, and has considered the resolutions passed by the Congress. Taking up the papers in order, and the resolutions contained therein, the Committee has the following remarks to make:

I.—Paper by M. Jean Hersent (Volume 1, Page 107), on "The Utilization of Commercial Ports".—Resolutions on Pages 117 and 118.—

"1. Considerant la necessité de construire vite et economiquement les ouvrages qui doivent repondre a l'accroissement du tonnage de la marine marchande, le Congrès emet le vœu:

"(*a*) Que pour les ouvrages importants il soit etabli et mis au concours un programme de previsions correspondant aux besoins de l'avenir, et que les efforts essentiels soient repartis principalement sur quelques grands ports."

The Committee approves this resolution. It is very important to establish a plan of operation which can be carried out as rapidly as opportunity and funds permit, and which will result in the greatest immediate benefit to the large ports. The programme should be planned in such a way that resources will not be scattered or the attainment of immediate results unduly delayed.

Experience in the United States has demonstrated that execution by contract after competitive bidding is an economical and desirable method of carrying out such work.

"(*b*) Qu'il soit prevu des ouvrages de construction economique et rapide tels que des estacades, piers ou wharfs, ducs d'Albe a l'exclusion de quais pleins, partout ou les conditions techniques le permettront."

The Committee agrees with this recommendation, especially in view of the fact that one of the results of the war will be the changing of trade routes, and it will be necessary for France to act quickly in providing facilities for handling overseas traffic.

"2. Considerant que les plans des bassins doivent prevoir l'avenir, le Congres emet le vœu que soit adopté et developpé le systeme usité en Amerique de wharfs paralleles qui, en permettant l'allongement des ports, facilite aussi l'installation des voies ferrees de service."

We entirely agree with this recommendation. Experience in America has shown the great advantage of railroad tracks along the wharfs parallel to the ships' berths, permitting the rapid handling of cargo from the ships to the cars, or *vice versa*.

"3. Considerant que le developpement des ouvrages interieurs de nos ports demande la creation de rades-abris, le Congres emet le vœu que des rades-abris soient envisagees et etudiees aux ports du Havre."

We agree with the recommendation. Experience in the United States has shown the advantage of safe anchorage space in the roadsteads, away from the wharves, where overside stream delivery or receipt of cargo may be made to or from barges, lighters, or other means of conveyance. This will also relieve the congestion at the docks.

"4. Considerant l'importance jouee par l'outillage dans nos ports, le Congres emet le vœu l'étude de l'outillage mécanique soit faite en même temps que celles des ouvrages fixes et sur un plan d'ensemble.

"Que l'on applique les methodes nouvelles en modernisant l'outillage, en adaptant les apparaeils de levage et de manutention aux systemes d'accostage.

"Que l'usage de l'outillage soit mis a la disposition de toutes les marchandises susceptibles d'en profiter.

"Qu'il soit prevu des terres-pleins spacieux, hangars, silos, elevateurs, magasins pourvus de tous les perfectionnements modernes.

"Enfin que les raccordements de voies de quais avec les lignes des gares de depart direct fassent l'objet d'une etude attentive afin d'eviter les encombrements et l'amoncellement des marchandises dans les ports de commerce."

The Committee entirely approves this recommendation. The rapid handling of freight, permitting quick departure of vessels, is a most important factor in the economy of ocean transport.

Furthermore, the Committee thinks that there is scarcely anything more important than close connections between railroad tracks and the wharves.

"5. Considerant l'augmentation croissante des dimensions des navires et les difficultés qu'ils rencontrent pour entrer de jour et de nuit dans les bassins a flot.

"Considerant l'insuffisance des bassins de radoub actuels pour la reparation ou l'entretien des navires.

"Le Congres emet le vœu:

"1°—Developper les bassins a maree en eau profonde.

"2°—Developper la construction des grands bassins de radoub a double entree quand les dispositions du port le permettent."

The Committee believes that the Congress would do well to study the methods in use in America for loading and unloading facilities alongside the wharves, even where there is a considerable range of tide, without the use of enclosed basins entered through locks. Experience in our ports, and at Panama, has demonstrated that locks are not necessary, even where the range of tide is very considerable. If the docks are equipped with proper mechanical devices for loading and unloading, it makes little difference whether the vessel stands high or low above the dock. The Committee will not attempt to fix the limit of tide above

which locks should be used, but, at some American ports, they have not been found necessary with a range of tide of 6 or 7 m.

The proper facilities for the repair of vessels should be provided at every large port.

Resolutions on Pages 124 and 125.—

"1. Considerant que le regime actuel de nos ports doit etre en rapport avec les necessités economiques du pays et que le developpement de ces ports ainsi que leur meilleure exploitation sont devenus indispensables;

"Considerant que l'avenir de nos ports de commerce et les moyens d'entirer avantageusement parti dependent uniquement des dicisions a prendre par l'Etat;

"Le Congres emet le vœu que l'Etat, avant d'engager de nouvelles et importantes depenses, ait recours, pour la construction et l'exploitation de nos ports de commerce: soit au regime d'une Administration autonome concue sur des bases pratiques et industrielles, soit au systeme des concessions avec ou sans garantie d'interet."

The Committee approves this recommendation.

"2. Considerant que la loi sur l'automonie des ports votee en 1912 a donne lieu a un reglement d'Administration qui ne tient pas suffisamment compte des desiderata exprimes par les Chambres de commerce et qu'en consequence l'application s'en est trouvee empechee;

"Le Congres emet le vœu:

"Que la loi de 1912 soit maintenue et le reglement paru en 1916 modifié et que dans la composition du Conseil de direction, il soit reservé une place plus importante aux representants competents de l'industrie, du commerce et de la marine non seulement de la localité, mais de la region interessée au developpement du port."

The Committee is not informed in reference to the law of 1912 or the regulation of 1916, but it believes that it is very important that competent representatives of the industries should have a voice in the decision of matters relating to the development of ports—subject, of course, to the power of decision of some competent public authority.

"3. Considerant que, dans les ports ou le regime de l'autonomie ne serait pas appliqué, la dispersion des chapitres de recettes et depenses entre plusieurs services ou organismes: services des travaux, de l'outillage, des chemins de fer, etc., ne permet pas d'avoir une vue d'ensemble aussi bien sur l'importance du port que sur les sacrifices consentis pour son developpement, son entretien et son exploitation.

"Considerant, d'autre part, que de l'etat actuel des choses il resulte que les recettes et produits sont consideres par l'Etat comme formant une masse a repartir ensuite indifferemment sur tous les ports, en sorte que les ports deficitiaires vivent aux depens

des ports beneficiaires, alors que ceux-ci sont parcimonieusement pourvus des installations qu'appellerait precisement le developpement de leur traffic.

"Le Congres emet le vœu;

"Que chaque port centralise la comptabilite de tous les services, de maniere a faire établir annuellement un bilan de recettes et depenses afferentes a chaque port, en meme temps qu'une bonne statistique."

The Committee approves this recommendation. The financial and other statistics relating to each port should be kept separate, in order that improvements may be made in such a manner as to be economical, efficient, and to meet the needs, not only of the ports, but of the country as a whole.

"4. Considerant que la creation de zones franches ou les marchandises pourraient etre entreposees en franchise, melangees, ameliorees, transformees, mais non usinees, aurait pour consequence d'accroitre le mouvement maritime et l'activité industrielle qui en derive;

"Le Congres emet le vœu qu'il y aurait lieu, dans l'interet du commerce general, d'autoriser, dans l'enceinte douaniere de nos grands ports, l'essai de zones speciales, appelees *zones franches*, dans lesquelles les marchandises pourraient etre entreposees en franchise, melangees, ameliorees, transformees, mais non usinees, et sans formalites speciales douanieres dans l'interieur de la zone."

The Committee approves this recommendation.

II.—Paper by M. Paul Govare (Volume 10, Page 106), on "Free Ports".—This report deals with the question of free ports. It does not, however, contain any conclusions or resolutions adopted by the Congress. It is, therefore, not necessary for the Committee to remark on it, except to say that the experience of Hamburg and other free ports seems to demonstrate the desirability of at least making an experiment in this direction.

III.—At the meetings of the Committee we were asked our opinion with reference to the proper dimensions of locks, and we were unanimously of the opinion that it would not be wise to provide for locks of greater dimensions than those used for the Panama Canal. We, therefore, agree that these dimensions, *viz.*, length, 1 000 ft., width, 100 ft., and depth, 40 ft., should be the greatest dimensions of vessels for which it would be necessary to provide.

We were also asked with reference to economical methods of handling cargoes at docks, and with reference to dry docks and floating docks. We promised to send to the Congress, after our return to America, a report dealing with these subjects.

We were also asked with reference to methods of administration of ports—whether by the State, the city, the railroad companies, or the

steamship companies. We promised to submit a report on this question also.

These reports will also deal with the kinds of dredges used in the United States, their capacity, the depth of water in which they can operate, and other similar questions.

COMMITTEE ON WATER POWER.

Report by M. Verdin.—Page 44 of the Proceedings of Section I.—The conclusions of the Congress, with our remarks, are as follows:

A.—"Que les pouvoirs publics discutent et promulguent, dans un delai aussi court que possible, le projet de loi deposé par le Gouvernement sur le bureau de la Chambre des Deputes dans sa seance du 20 Juillet 1917."

In view of the fact that the Commission is not fully informed regarding the law referred to, and the circumstances affecting it, we do not feel that we can comment on this resolution.

B.—"Que l'administration continue et acheve l'etude des resources hydrauliques de la France."

The Committee strongly endorses this conclusion. Attention is called to the fact that if partial development of the power of a stream is made before an exhaustive study of its entire possibilities has been completed, it may be found later that such partial development has led to a situation preventing the most economical utilization of the entire stream.

C.—"Que les encouragements de l'Etat soient assures a ces entreprises, tant par des subventions financieres, quand il y aura lieu, que par un regime d'associations syndicales permettant aux industries de recuperer partiellement les sommes qu'elles auront investies dans les travaux de regulation ou d'amenagement des cours d'eau."

The Committee is convinced that no project should be undertaken unless it can be demonstrated with reasonable certainty to be economically justified and self-sustaining, all elements of the problem being considered. The Government should undoubtedly encourage those projects which can be so justified, and, if it can render financial aid, it is desirable that such aid should be extended as a temporary measure, or in view of demonstrable collateral advantages.

D.—"Que la fabrication des machines hydrauliques et electriques en France soit developpee, par l'initiative des particuliers et avec l'appui des pouvoirs publics."

The Commission is of the opinion that France should encourage the manufacture of all machinery required for hydro-electric development within her own borders, but if the development of hydro-electric power

in France would be unduly retarded by waiting for the home production of such machinery, it would be wise to make such purchases as may be necessary abroad, pending the time when French factories are able to supply French requirements. If the exclusive use of French material is insisted on, under all circumstances, it may result in a loss to the country rather than a gain.

E.—"Que les autorisations relatives a la creation des reseaux electriques soient subordonnees a l'obligation, pour les concessionnaires, d'adopter des types de courant permettant le raccordement facile avec les reseaux voisins preexistants."

The Commission emphatically endorses this conclusion, and expresses the opinion that it should be made more definite and inclusive. It is of the greatest importance that standard characteristics for current from all plants, for which concessions are granted in the future, should be promptly established and rigidly enforced, having in view the fact that France is of such an area and form that it can be covered ultimately by a unified system of power distribution fed from many different sources. This would be of great economic value, because of its resultant equalizing of non-synchronous seasonal variations of stream flow in different localities, and because it will permit the most effective and economical co-operation of steam and water power in supplying electric power for all purposes throughout France.

Report by M. Henri Defer.—Page 106 of the Proceedings of Section II.—The resolutions adopted, with our comments, are as follows:

A.—"Qu'une entente benevole s'etablisse entre les exploitants des forces et des beautes naturelles du territoire national egalement interesses a l'utilization des unes et de la conservation des autres et, qu'a l'exemple du Comité des forces hydrauliques et du Touring-Club de France, l'institution de Commissions mixtes d'etude des projets de derivation de cours d'eaux et de constructions d'usines soit generalisee entre les divers groupements interesses."

The Commission endorses this recommendation, and is of the opinion that no time should be lost in instituting the mixed commissions referred to, and in imposing on them the duty of making definite decisions with such promptness that the utilization of water powers which may be found economically available, shall not be unduly delayed.

B.—"Qu'il soit procede a une etude d'ensemble pour l'amenagement en montagne sur des points bien choisis de barages et reservoirs propres a regulariser le debit des rivieres et a rendre ainsi possible une meilleure et plus complete utilization des forces hydrauliques du pays, tout en assurant la sauvegarde de ses beautes naturelles."

The Commission endorses this recommendation.

Report by M. Jean Rey.—Pages 31 and 32 of the Proceedings of Section VI.—The conclusions, with our comments, are as follows:

A.—"Le Congres, vu la necessité imperieuse de doter notre Industrie d'une loi generale reglant l'amenagement de nos forces hydro-electriques, demande aux Pouvoirs publics de faire voter d'urgence le projet de loi deposé au Parlement en juillet 1917, et elaboré par une Commission extra-parlementaire, relatif a l'utilisation des forces hydrauliques.

"Le Congres rappelle au Parlement que cette loi si importante attend, depuis plus de 20 ans, le bon plaisir de nos elus, et que, pour cette branche de notre activité nationale comme pour toutes les autres, la routine et les lenteurs de nos legislateurs entrainent les consequences les plus dommageables pour la prosperité de notre industrie et de nos finances."

The Commission is not informed in regard to the provisions of the proposed law, and, therefore, does not comment on it. We are strongly impressed, however, with the fact that France is paying annually very large sums for imported coal, and that it is of the utmost importance for the prosperity of the country that the development of hydraulic power, wherever economically practicable, should be encouraged and promoted as rapidly as possible.

B.—"Le Congres demande aux pouvoirs publics d'accorder aux Etablissements de credit hypothecaires, les autorisations necessaires pour permettre le pret sur hypotheque pour les chutes hydrauliques, cette modification etant accompagnee des conventions necessaires fixant les bases et les modalites de ce genre nouveau d'hypotheque."

If the water powers of France are to be developed by private enterprise, it is the opinion of the Commission, based on experience in America, that the plan contemplated by this resolution, or its equivalent in some other form, is essential.

C.—"Le Congres, constatant l'interet national qui s'attache a la jonction et a l'uniformisation de nos reseaux de distribution d'electricite, demande aux Pouvoirs publics de prescrire, pour les transports nouveaux d'energie electrique, l'emploi du courant triphase a la frequence de 50 periodes par seconde, et dans le cas d'applications speciales necessitant une frequence moindre, celle de 25 periodes."

The Commission is of the opinion that a frequency of 50 periods per sec. should be prescribed generally for local distribution of electricity in France, but calls attention to the fact that if the great undeveloped power resources of France are ultimately to be utilized to the best advantage, it will be necessary to connect, by circuits operating at very high potential, sources of power separated by great distances,

as, for example, the Upper Rhône and the coal fields in Northern France. For transmission over such distances, the frequency of 25 cycles affords material advantages, particularly as regards regulation of potential. It would seem, therefore, that for installations which probably will be thus connected, the frequency of 25 cycles per sec. should be considered very carefully.

D.—"Le Congres recommande aux concessionnaires de transport d'energie electrique de limiter, pour les nouvelles installations, le choix du voltage a l'un des taux qui seront indiques par le Ministere des Travaux Publics, et, dans l'avenir, lorsqu'il sera question de remanier un reseau existant en modifiant son voltage, de s'arreter a l'une des valeurs ainsi determinees."

The Commission strongly endorses this recommendation. Standardization of electric apparatus is essential to large production and low cost.

E.—"Le Congres signale aux exploitants des distributions d'electricite l'interet capital qu'il y a, des maintenant, a etudier et a realiser toutes les dispositions permettant l'entr'aide des reseaux les uns par les autres."

The Commission endorses this recommendation.

F.—"Le Congres, constatant l'interet economique qu'il y a à diminuer l'importation du cuivre consommé par notre industrie electrique, recommande aux concessionnaires de reseaux d'electricité l'emploi de l'aluminium, metal que la France peut produire en quantité illimitee."

The Commission concurs in this recommendation as regards electric conductors not covered by continuous insulation. Other things being equal, the use of aluminium is obviously advisable.

Report by M. de France.—Pages 61 and 62 of the Proceedings of Section VI.—The resolutions proposed, and our comments on them, are as follows:

"Le Congres, considerant que l'amelioration de nos moyens de transport est une condition essentielle a la prosperite economique du pays, exprime les voeux suivants:

"1.—Que les Compagnies constituent une Commission d'etudes pour l'application immediate de la traction electrique a tous les cas ou les experiences anterieures ont prouve que cette application etait avantageuse: lignes de banlieue et de grande banlieue jusqu'a 100 kilometres, lignes de grand trafic a grande periodicite, lignes de montagnes et principalement dans les regions ou les installations hydro-electriques fourniront de l'energie a prix reduit;

"2.—Que les Compagnies adoptent, le plus rapidement possible, dans toutes leurs gares, des appareils electriques de manutention, de signalisation, d'aiguillage, et, dans toutes les gares de triage, de bifurcation et d'embranchement, des locomotives et appareils electriques de manoeuvre;

"3.—Que les conventions de 1883 soient modifiees et que la duree des concessions soit prolongee avec relevement temporaire des tarifs, afin de permettre aux Compagnies de Chemins de fer, sans recourir au credit de l'Etat, de realiser l'electrification successive des diverses lignes de leurs reseaux;

"4.—Que le Comite d'electricite procede, des maintenant, a la revision des reglements techniques pour l'application de la loi du 15 juin, 1906, les mette en harmonie avec les nouvelles decouvertes de la science, les resultats pratiques de l'experience, reforme notamment l'arrete technique du 21 mars, 1911, dans un sens plus large et plus conforme a la technique de distribution pour les voies ferrees."

The Committee, so far as it can express itself, approves of these resolutions, although it is not informed with reference to the conventions of 1883, or the law of June 15th, 1906, or the *arrete technique*. It is clear, however, that previous regulations should be modified in such a manner as to conform to new discoveries or improvements in the application of electricity, and that the railroad companies should be encouraged in every legitimate way in the electrification of their lines, if it can be accomplished economically.

Report by M. Paul Toulon.—Page 11 of the Proceedings of Section X, 3d Sub-Section.—

A.—"Que les Pouvoirs publics favorisent le plus possible les installations nouvelles d'usines hydrauliques de production d'electricite et la distribution du courant aux plus grandes distances compatibles avec les progres techniques acquis actuellement, d'une part, et avec les frais d'etablissement acceptables, d'autre part."

The Committee approves this statement.

B.—"Qu'un programme d'ouvrages de distribution dont l'etablissement dans les premieres annees d'apres-guerre apparait des a present comme necessaire, soit mis a l'etude aussitot que possible et poursuivi suivant la methode heureusement employee pour la reconstitution des reseaux electriques des regions envahies."

The Committee entirely approves the recommendation that a programme be studied as soon as possible, but it does not know what method was used for the reconstitution of the invaded regions, and, therefore, can express no opinion regarding it.

C.—"Que les usines thermiques ou hydrauliques a construire en execution de ce programme soient prevues en tenant compte des reseaux existants et des conditions ou la production du courant sera le plus economique, la nature et la frequence du courant devant etre notamment arretees de maniere a permettre aux usines de s'entr'aider."

This recommendation appears to have been substantially covered by preceding demands of the Congress, which we have endorsed.

D.—"Que, simultanement, afin d'en permettre la realisation rapide, une etude soit faite des dispositions legislatives ou administratives a envisager pour faciliter aux entreprises de distribution concessionnaires de l'Etat, des departements ou des communes, l'obtention des capitaux necessaires a leurs extensions, en generalisant par exemple le systeme des avances faites par les communes, avec le concours du Credit Foncier, des caisses de credit agricole, etc.

E.—"Que tous les Pouvoirs publics examinent dans un esprit d'equite les demandes de relevements temporaires des tarifs que de nombreux distributeurs d'electricite se sont trouves dans l'obligation d'adresser aux autorites dont ils dependent.

F.—"Que pour faciliter le groupement des entreprises de distribution, dont les capitaux et les reserves sont generalement immobilises en totalite dans leurs reseaux, tous les actes de fusion de societies ou de concessions soient exempts des droits d'enregistrement en ce qui concerne la mutation afferente aux installations destinees a faire retour en fin de concession aux autorites concedantes.

G.—"Que, dans le mêne ordre d'idées, des mesures soient prises par l'administration superieure, pour qu'en cas de fusion d'entreprises de distribution, les transferts de concessions communales puissent etre soustraites aux exigences, parfois excessives, des autorites concedantes.

The foregoing paragraphs, D, E, F, and G, are concerned with legal and financial questions regarding which the present information of the Committee is not sufficient to justify an expression of opinion, beyond the statement that we regard it as obvious that effective measures should be taken as promptly as possible to facilitate the extension of existing electric installations and the construction of new ones in all parts of France where such extension or new construction can be justified by conditions of present demand for power, or by conditions which assure the development of an adequate demand when power is made available.

General Conclusions.—The general conclusions of the Committee may be summarized briefly, as follows:

France has within her borders, in three rather widely separated regions, water-power possibilities which are probably sufficient, if developed and utilized, to obviate the necessity now existing of importing coal for power purposes.

The Governmental authorities, in the interest of the nation, should take all steps possible, including the early passage of enabling laws, to encourage and stimulate the development and utilization of these natural resources. The broad national aspect of the problem should at all times be given full consideration.

The ultimate goal should be that of a unified and inter-connected system, in which the different groups of plants in the several regions of power development become elements of such a nation-wide system.

The importance and desirability of such a plan is emphasized by the study of the seasonal characteristics of the flow of the streams in the different regions. We are informed that the low-water flows in these several regions do not occur simultaneously. This being so, combined operation will make it possible to utilize a greater quantity of continuous power than can be utilized if the various groups of plants are operated independently. No insurmountable technical difficulties stand in the way of the operation of such a unified system. There exist in the United States power-distributing systems covering areas and distances comparable to those involved in a unified system for France. Although the Committee is not in possession of the data for an exact study of the cost and results of inter-connecting the several regions, a general consideration of the situation leads to the opinion that it would be amply justified.

In connection with such a system, consideration should be given to the possibility of supplementing the water power by steam power, perhaps, in some cases, by burning the lower grades of coal at the mines.

Such steam plants should be connected to the general distributing system, and operated in such a way as to supplement the varying quantity of power which can be derived from the hydraulic sources. The concentration of electric power production by steam in a small number of large modern plants will result in a great economy of coal, as compared to the quantity required to produce equivalent power in a large number of small steam plants; and, at high potential, such as is now in successful use in America, electric energy can be transmitted for much less than the cost of transporting the coal required to produce the same amount of energy. The use of auxiliary steam power developed in large plants properly inter-connected with hydro-electric plants can be utilized advantageously in supplementing power from the latter at certain seasons of the year.

The foregoing considerations emphasize the importance of standardization, and of limitations which should be placed on permitted frequencies and voltages.

Action on the part of individual companies to bring about the realization of such an ideal system of national power supply, as has been outlined, will probably not come unless the public authorities initiate it, or, by permissive and favorable laws, make such action both easy and profitable to them. In our opinion, the accruing advantages to the nation are sufficient to justify a very thorough study and analysis of the problem in all its technical and economic aspects.

COMMITTEE ON NAVIGABLE WATERWAYS.

The reports of the Congress contain two papers on this subject, and they will be briefly referred to. They are the report by M. le Colonel Espitallier, on the "Reseau de la Navigation Interieure en France," on page 50, of the Proceeedings of Section II, and the report by M. le Docteur Ed. Imbeaux, on "L'Interet de la Creation d'un Reseau de Grande Navigation Interieure en France: Principales Conditions de l'Etablissement et de l'Exploitation de ce Reseau," on page 66, of the Proceedings of Section II.

These two papers are very interesting. They give descriptions of the system of interior navigation in France, and the future requirements which the authors consider necessary. The resolutions deal chiefly with the special projects which have been made, such, for instance, as the improvement of the Seine, the Rhône, and the Loire Rivers, and the systems of internal navigation in the northeast and the southwest. The Committee has not had the opportunity to study these projects in detail, and, therefore, it will not comment specifically on the separate rosolutions. It will, however, state its views on the question of interior navigation, as follows:

By internal navigation is meant the provision of waterways for the use of barges or small boats, by: 1. The construction of canals; 2. Making the rivers navigable by locks, dams, canals, and other works.

Historical.—The development of transportation by internal navigation dates back to a period before the construction of railways, beginning with the construction of the early canals in England. At that time, it was undoubtedly wise and desirable that canals should be built and rivers improved for navigation, because there were no other means of transportation except by vehicles on roads, and it was obvious that a large tonnage could be handled much better on navigable waterways.

The construction of the English canals was followed by the construction of canals in other countries, such as the United States, France, Germany, Belgium, and The Netherlands. In some of these countries, extensive works of this kind were undertaken, and have been continued to the present day.

Experience in the United States.—In the United States, the experience with works of inland navigation has been disastrous. Almost all the early canals have been abandoned, and several of the States have lost all the money invested in them, and have been obliged to default on the interest on the debt created for their construction.

In some special localities, canals have proved of use, as, for instance, the canals at Sault Ste. Marie, between Lake Michigan and Lake Superior, carrying the large vessels of deep draft which ply on the Great Lakes.

With this exception, practically the only canal that has not been abandoned in the United States is the Erie Canal in New York State. After the construction of railroads, the traffic of this canal declined so rapidly that, in 1883, all canal tolls were abolished. The abolishment of tolls, however, did not check the decline of traffic, and although the traffic on the railroads was increasing by leaps and bounds, the traffic on the canal diminished to almost nothing.

In 1903, the sum of $101 000 000 was appropriated for enlarging the Erie Canal to a depth of 12 ft., sufficient for barges having a capacity of 1 599 or 1 699 tons. The sum appropriated did not provide for terminals, and the work has not been completed. The cost of the entire work, including terminals, will probably be considerably more than $130 000 000. The original appropriation of $101 000 000 will exceed $294 000 per mile. This work has not yet been completed, and many of our best engineers consider that it will not be successful and that the expenditure will prove to have been entirely wasted. In any case, it seems certain that a double-track railroad could have been constructed between the same points for much less, and with a much greater capacity than the canal.

The experience in the United States with inland waterways, therefore, has been entirely unfavorable, and has occasioned a careful study of the economics of the subject.

There are cases, of course, in which the construction of canals and the improvement of rivers for navigation are justified. In Europe, the conditions are much more favorable than in the United States, because the rivers generally have flatter slopes and there is not so much interference with traffic in the winter and by floods.

We are informed that, in France, the Government has assumed the payment of interest on all works of internal navigation and also the expenses of maintenance, so that the only charges for transportation are those paid to the boatmen. Nevertheless, in determining the economics of water transportation, these items should be included for, contrary to customary belief, such an expense paid by the State is, in fact, paid by the people just as much as if included in the actual charge for transportation.

There is no sentiment about transportation. The question is purely an economic one, and should be considered on economic grounds only. If the conditions in any special case are such that inland navigation can be provided, which will carry traffic cheaper than a railroad, and if the traffic is available and will produce a fair return on the investment, then the project is economically sound; otherwise it is not, and should not be attempted.

We have been surprised that nowhere in the papers which we have read, or in the projects which have been explained to us, has there been

any economic study of these questions, but only a technical study. We have been surprised, also, that, in the proceedings of the Congress, there has been so little attention given to the subject of railroads—although this is undoubtedly the most important agency in the development of national prosperity.

We are strongly impressed, as a result of our visit to France, with the necessity and desirability of the development of three great factors in national prosperity, *viz.*, the ports, the railroads, and the water powers. If France is to have the trade which it deserves, it must develop its ports so that it can handle that trade.

Again, the great lack of France is coal, of which it has not enough to supply its needs. Moreover, every pound of coal that is burned is lost forever, and will never be available for future generations. Coal, therefore, has an economical value in addition to its material value in dollars and cents, and it is extremely important that all reasonable means should be taken to conserve the supplies of coal, so that the future generations will be assured the heritage which properly belongs to them.

On the other hand, France has large undeveloped water powers, some or many of which, especially in view of the shortage of coal and its economical value, may be economically developed.

We have been informed that many water-power projects have been delayed for years, on account of the desire to await the development of navigation. We believe that the two interests, while they have much in common, are also, in a sense, antagonistic. The four purposes of control of a river are: For the development of power, for irrigation and the supply of cities, for the improvement of navigation, and for the regulation of floods. These four purposes are, in some ways, antagonistic. If a river is used largely for navigation, its value as a source of power may be diminished, on account of the water used for lockage; and if the regulation of floods is the object in view, the management of reservoirs may be entirely different from the management if the development of power is the aim.

The four uses of water should be considered together. All the countries of the world are facing immense expenditures, not only for the payment of the debts incurred by the war, and for the restoration of devastated regions, but for works of internal improvement, which are necessary. At no time in history has it been more important to study the economic advisability of the projects proposed. There should be no scattering of resources. Efficiency and the avoidance of waste should be the aim, and no project should be undertaken, which cannot be demonstrated with reasonable certainty to be economically justified.

We have not studied the special projects for inland waterways, as we have not had the time. We, therefore, pass no judgment on them. As

we have already stated, certain works of river improvement, and certain canals, may be justifiable, but each project, before it is undertaken, should be proven economically justified, and due allowances made for all expenditures from whatever source.

Water-power developments, of course, should be studied, having in view the possible requirements of navigation. If this is done, and if works of internal navigation are later decided to be advisable, water-power improvement will prove to have been a benefit to navigation.

Railroads.

There is one paper on railroads in the proceedings of the Congress, *viz.*, by M. Toulon, on "Les Chemins de Fer Apres la Guerre." Although our Delegation has no special Sub-Committee on Railroads, we desire to say that we entirely approve of the resolutions submitted in this report. We are specially impressed with the suggestion that the railroads join in making their studies and tests, for the sake of economy and efficiency.

France is the most individualistic country that we have seen. We think that it is too individualistic, and that it has not yet appreciated the benefits of co-operation and the fact that industrial progress depends on the proper balance between individualism and co-operation. France is so individualistic that it has not yet adopted common standards. The result is a waste of effort and efficiency. We have been impressed by the fact that, if France is to trade with other countries, it is very desirable that it should adopt standards conforming essentially to those of other countries; or, that if it has changes to suggest, it may agree with other countries as to those changes.

The suggestion in this paper of M. Toulon, that the interests of the railroads are common, and that economy and efficiency would result from studies and tests in common, seems to us to be obvious.

Committee on Roads.

The only paper presented to the Congress relating to the subject of roads is that of M. Georges Dumont (page 67 of the Proceedings of Section I). The Sub-Committee of the Delegation discussed this paper and other matters presented to it with the Committee of the Congress. Our Committee submitted the following memorandum in reply to the memoranda submitted at the meetings.

During the last few years in the United States the material used in road construction has been principally bitumen in its various forms, cement, concrete, and brick. The different methods in which bitumen has been used are known as the bituminous concrete pavements and bituminous macadam pavements.

A bituminous concrete pavement is one composed of broken stone, broken slag, gravel or shells, with or without sand, Portland cement,

fine inert material, or combinations thereof, and a bituminous cement incorporated together by a mixing method.

A bituminous macadam pavement is one having a wearing course of macadam with the interstices filled by a penetration method with a bituminous binder.

Bituminous concrete pavements are sometimes divided into three classes:

Class A.—A bituminous concrete pavement having a mineral aggregate composed of one product of a crushing or screening plant.

Class B.—A bituminous concrete pavement having a mineral aggregate composed of a certain number of parts by weight or volume of one product of a crushing or screening plant, and a certain number of parts by weight or volume of sand, broken stone screenings, or similar material, with or without a filler.

Class C.—A bituminous concrete pavement having a predetermined mechanically graded aggregate, composed of broken stone, broken slag, gravel or shell, with or without sand, Portland cement, fine inert material, or combinations thereof.

Sometimes when a water-bound macadam pavement has been laid for some time and requires improvement, a thin coat of bituminous material is spread over the surface. While this cannot be considered a permanent construction, it has been used to quite an extent on light traffic roads, with good results. It is specially good as a preventive to dust.

Which of the foregoing kinds of pavement are to be used in any particular case must be decided by conditions, the principal ones being traffic, first cost, cost of maintenance, life of the pavement, and the availability of the material.

In considering the traffic, there must be taken into account, not only the volume, but also the units of traffic. It will be easily understood that 10 000 tons of traffic in units of 10 tons will injure a pavement more than the same amount of traffic in units of 1 ton. In the former case, the pavement must be given a solidity that will sustain the heavy units.

In considering the matter of cost, it must be remembered that first cost is not the only item that makes up the ultimate cost of the pavement, but the cost of repairs must be carefully considered. Very often a pavement, the first cost of which is great, will be less expensive in the long run on account of the lesser cost of maintenance. It is easily understood, of course, that the longer the pavement will last, the cheaper it will be as a general proposition. It must also be remembered that certain materials, like bitumen, have a certain durability irre-

spective of traffic, while others, like stone, for instance, are worn out or destroyed only by traffic.

The availability of material is always an important consideration. It would be useless to think of a material for road work which is at so great a distance from the point of use that the freight charges would make it too expensive. Often a poorer material should be used when, theoretically, a more expensive and more durable one would be advisable.

The Delegates herewith submit for your information specifications for, and descriptions of, the different kinds of roads in use in America herein referred to. These specifications are proof sheets of a "Highway Engineers' Pocket Book", which is to be published in the United States in the early part of 1919. They also submit formal contract and specifications of the New York State Highway Commission, covering the construction of all roads used in that State. Also, a copy of a report made by a Special Committee of the American Society of Civil Engineers on "Materials for Road Construction and on Standards for Their Test and Use." In this latter document, special attention is called to the definitions of various terms used in road construction, which will be found on pages 1420 to 1429, inclusive.

Although it was stated at one of the meetings of the Committee that conditions were such in France that brick and cement concrete could not be used to advantage, it was thought best by the American Committee to furnish information regarding these roads to the French Committee.

The Committee, too, would suggest a further trial of cement concrete for road work. It must be remembered that when any new type of road is first used, errors are apt to occur in construction, which give bad results, and, at first glance, it would seem to reflect on the material used, when, as a matter of fact, the trouble is in the method of construction. The character of cement concrete roads in America has been improved very much during the past five years, as a result of which large quantities are being laid in practically all the States doing road work. With the natural tendency of the French engineers to work carefully and to achieve good results, it is thought that, possibly, if another trial is given, taking into consideration American practise, results may be achieved that will be more satisfactory than in the past.

Brick roads have been used in the United States to a great extent, and very satisfactorily. In many portions of the country, stone or other paving materials are extremely scarce, and where a clay, or a clay mixed with shale, can be obtained that will produce a good paving brick, such pavements can be laid with satisfactory results.

If, in France, clays or shales can be obtained which will produce brick that will stand the specifications provided for American brick,

there ought to be little to fear in their use. It must be distinctly understood, however, that the brick must be good, in order to produce good pavements.

Referring specifically to the propositions submitted at the first meeting of the Committee, held on December 20th, 1918, the American Delegates would say as regards methods of construction:

1st.—That they heartily agree with the proposition that broken stone roads have been found to be unsatisfactory for motor vehicles of heavy weight and great speed, and that, consequently, this method of construction should be given up for road surfaces carrying a large amount of traffic. This conclusion has been reached in America, and what is known as water-bound macadam is sometimes used, but only where a temporary roadway is required.

In arriving at this conclusion, the American Delegates wish it to be clearly understood that they recognize fully the value of these water-bound macadam roads during the recent war; that, while they did suffer materially under heavy traffic, yet their character was such that repairs could be quickly made and the roads kept in almost continuous use. This, of course, was expensive, but, in war times, quick results are necessary, rather than cheap ones; and construction methods are perfectly proper and justifiable in war, which would be very extravagant in times of peace.

2d.—That they fully agree with the conclusion that surface applications of bitumen to broken stone surfaces have not been satisfactory for heavy traffic, but that a more satisfactory surface known as "asphalt macadam" can be constructed, by what is known as a "penetration" system, and that it can be laid in the way referred to so that good results can be obtained. In the construction of bituminous concrete pavements, a much more elaborate plant is required, which, naturally, makes the cost of the road surface more expensive. It is thought, however, by many people, that the extra cost is justifiable on account of the greater durability of this class of pavement.

In the memorandum, it is stated that experience has demonstrated that, if carefully constructed, this class of pavement will stand heavy traffic for ten years or more. The American Delegates think this is a rather optimistic view. It depends, however, on just what is considered "heavy traffic". The word "heavy", as applied to traffic, is a very indefinite one, for with the increased weight of trucks that have been in use during the last two or three years, what would be considered heavy traffic five years ago would be medium traffic at the present time.

3d.—The statement that the highest type of asphalt surface is that constructed with a mineral aggregate of sand of very fine nature, to which a proper quantity of dust and asphalt is added, is undoubtedly correct for a city pavement. It is, however, exceedingly doubtful if

such a pavement would withstand the heavy units of motor traffic that are in use at the present time and likely to increase in the future.

4th.—That, as to the use of brick for road construction in France, they feel some hesitancy in making any recommendations, other than what has already been said upon the matter, as they are unfamiliar with the character of shales and clays in France.

Financial Questions.—The American Delegates have been asked for an expression of opinion as to the methods of financing road improvements in France, and the possibility of inducing private companies or contractors to undertake such work, receiving their compensation in a number of annual installments, fifteen such payments having been suggested.

There are submitted herewith advance sheets of a section of the "Highway Engineers' Pocket Book", already referred to, in which are described the various methods of financing such work in the United States, where the funds are invariably raised by the city, town, county, State, or Federal Government, and the contractors are paid in full as soon as the terms of their contracts have been complied with.

Such contracts sometimes provide for the maintenance of the road surface for periods varying from 1 to 3 years, a small percentage of the contract price being retained during the maintenance period.

The methods of raising money by the issue of long-term bonds, short-term bonds, serial bonds, general taxation, and special assessments, are described and their relative advantages discussed.

The cost of paving city streets is generally assessed on the property fronting on the street; but, for the main trunk roads, the cost is met by the town, county, or State—the work they pay for usually beginning or ending at the corporate limits of the town or city, leaving the portions of the road within such limits to be improved by the municipal corporation.

As to the willingness of private companies or contractors to finance road improvements with their own funds and accept payment in a number of annual installments, there can be little doubt—provided such companies or contractors are given entirely satisfactory guarantees of payment. It must be pointed out, however, that they would be obliged to borrow the money, thus paying a higher rate of interest than the State, and that they would probably expect a larger profit and a good rate of interest on all their carrying charges, so that the amount of work done for the same total expenditure would be probably much less than if they received prompt payment in full and release from their obligations. The credit of the State would be better than that of private companies, and it would seem that it should be availed of, in order to secure satisfactory results with a minimum of expenditure and in the shortest possible time.

At the meeting of January 3d, 1919, the Committee submitted for the files of the Commission numerous documents dealing with the construction of roads in the United States.

After an exchange of views, the following conclusions were unanimously carried:

1.—Broken stone roads, which have proved until now sufficient for urban communications, are soon deteriorated by the travel of motor vehicles, and do not agree any more with this kind of travel. The tarring, which has done undeniable service against dust, only very insufficiently preserves the road surface from the wear and tear due to the travel of vehicles of mechanical traction.

2.—New systems of construction have been experienced. Among them must be retained cement concrete and bituminous and brick coatings. Experience extending over a sufficient number of years has shown that the preference to be given to one or the other of these various systems of construction depends on several factors: climate, intensity of travel, cost price, etc. The brick coating in use in America could only be used in exceptional cases in France. Cement concrete roads are only advisable in countries where the materials used in their composition are at hand at advantageous prices.

3.—Roads constructed with bitumen or asphalt aggregates are, unfortunately, very expensive, but they have the advantage of requiring less maintenance than broken stone roads. For an equal travel intensity, they answer much better the exigencies of the travel of motor vehicles.

4.—The price of laying these roads is considerably lowered when this system of construction is applied to broken stone roads, the old broken stone constituting a good foundation.

5.—The reconstruction of the French road system is necessary, on account of its profound deterioration, due to the travel during the war. It would be a fault to restore it to its former state, as thus it could not withstand the travel of motor vehicles, which intensity will grow rapidly, in order to comply with the industrial and commercial requirements, as well as with those of tourists, and the expenses for the maintenance of the road would grow considerably, without giving satisfaction to those who use it. Happily, most of the French roads can make excellent foundations to which it will be sufficient to apply appropriate coatings. On these conditions, it will be possible to adapt the roads to the new requirements without laying out a too considerable capital.

It would be logical that the expenses relative to the improvement and maintenance of the roads should be borne by those who use them, and the borderers who profit by the travel. This principle, admitted and applied in some foreign countries, permits the issue of bonds for the construction and improvement of roads, the capital being guaranteed

by taxation and revenue which are certain and which increase with the intensity of the travel, as, for instance, taxes on motor cars, on essence, etc. Unhappily, the fiscal legislation in force in France does not allow the use of this procedure, and as it is not possible to count on voluntary contributions, it is necessary to have recourse to the budget of the State, "Departements", and "Communes", in order to obtain the necessary allowances to bring the road system to a state capable of facing the new requirements.

If, however, the State, "Departments", and "Communes" could not find the necessary capital, private enterprises could be organized to execute the construction of some well-defined portions of roads, guaranteeing their maintenance during a certain number of years, with the proviso that an annuity, including the old yearly price of maintenance increased by the present plus-value and by a supplement justified by the realized improvements, should be provided.

Though this proceeding may be more expensive than direct construction through the Public Works, it will be necessary, perhaps, to have recourse to it, on account of the circumstances created by the war.

Besides, the study of the financial question will have to be pursued in subsequent discussions with the co-operation of persons well qualified for giving useful advice.

Committee on Agricultural Development.

The various papers relating to this subject are included in Section VII of the reports of the Congress, and contain various conclusions and resolutions which are of great interest. Our Committee, however, has not taken up these conclusions and resolutions in detail, but has considered the subject in a more general manner and has submitted the following memorandum containing its conclusions.

The Section of the Congress which has discussed agricultural questions, finds that the necessary rehabilitation and expansion of this vitally important industry in France should be based on improved financial facilities. The latter, in turn, require modifications, in our opinion, in the banking laws and arrangements of France along several lines, including the following:

1.—Working capital for farmers, to permit them to purchase required mechanical equipment, animals, fertilizers, seeds, etc., should be obtainable from the sale of long-term farm bonds, founded on safe mortgages of sufficiently large co-operative groups of farms, granted under adequate supervision and guarantee of the National Government, with the banks selling such guaranteed bonds given a reasonable commission, so as to make it to their advantage to popularize such guaranteed bonds among the investing public.

2.—Safe and convenient procedures, with standardized blank forms, for establishing chattel mortgages on movable property should be provided, so as to afford satisfactory collateral or pledge to banks authorized to make loans to the owners or prospective purchasers of such property, including industrial equipment, crops, agricultural products, merchandise, etc.

3.—A comprehensive and convenient system of warehouse receipts, bills of shipment, or lading, acceptances by commission houses, and other documentary proofs of the movements of merchandise in transit from their points of origin to points of final destination, and payment should be devised under suitable Government supervision and protected by adequate insurance against loss, so that such records of property may be safely accepted as collateral by banks authorized to make loans to their owners.

4.—With amendments made to banking laws so as to permit the convenient hypothecation of property of various kinds on which loans are sought for periods up to 1 year or more, it is necessary also to consider time deposits in banks for periods much in excess of 90 days, and to see to it that laws and decrees are formulated in a sound legal manner satisfactory to the banking interests proposing to operate under them.

5.—The manner and extent to which the supervision credit and guarantee of the Federal Government of France is pledged to the protection of money lenders, should be published in a very clear manner. Likewise, the advantage of ample working capital should be made plain at once to the French farmers, so that they will not be handicapped, as compared with farmers of other nations, in storing and preserving their products for advantageous sale at home or abroad in ways which should be given full and wide publicity.

The foregoing suggestions are based on practical experience in America. They deal with certain principles which it is hoped may be of benefit in modifying French banking facilities. Obviously, it is out of the question to attempt here to detail further a subject which is so intimately related to existing laws and decrees in France.

Mechanical equipment for French farmers should be adjusted to the soil, climate, customs, and preferences of France and the countries to which it proposes to export agricultural implements. In adapting munitions and other plants to their manufacture, great effort should be made to standardize types of machines and equipment and of all parts thereof, so as to facilitate quantity production and thus to secure the resulting economies.

France could adopt to its advantage American methods of establishing in various sizable cities modern slaughter houses and cold storage plants for all meat products. The same is true of a certain number of refrigerator cars for transporting such products from the rural districts

to the larger cities. This will require modification of the laws and the establishment of effective sanitary supervision of all the branches of this industry, including the central markets.

The drying of fruits and the concentration of fruit juices for shipment, and for stabilizing the wine industries, are steps worthy of most careful development.

Storage of farm products in metallic containers on the farm and the establishment of central silos or grain elevators of concrete, are American customs which seem applicable for use in France, particularly in the devastated area and at a time when a change to new customs is easier than ordinarily. With central storage plants, there should be established a system of official inspection and classification as to quality of produce received, with receipts issued in such a way as to be usable as collateral or pledge at bank.

Fertilizers and soil disinfectants, especially potash salts from Alsace, should be quickly industrialized for export, and be exploited.

The reconstitution of French agricultural methods, in so far as this can be undertaken to advantage, should be decided on as quickly as possible, during the present period of general commercial readjustments. Great aid would follow the wide publicity of, through Government channels, details of recommended changes in procedure and the reasons for their adoption.

Should co-operation be desired from America along any lines, it is best that each specific case be dealt with separately. American capital in substantial sums is not likely to come to the aid of French agriculture, except under conditions satisfactory to American bankers, and, doubtless, on the recommendation of American engineers.

Commercial organization to exploit American methods in France should give due consideration to using for a time at least American supervision, so as to teach the details to French associates.

In France, as in America and other countries, hygienic conditions among the farmers are not as favorable as in the cities. This is due to ignoring well-known public health teachings in relation both to personal hygiene and community sanitation. It can be corrected only by persistent and systematic campaigns of publicity through the aid of practising physicians, health officers of communes, school teachers, and influential citizens, all of whom can advantageously be guided at district conventions conducted by the National Health Council. It is well to remember that the transmission of disease by flies may be a much more serious factor in the future than before the war which has brought millions of foreign troops to France.

Rural welfare movements to increase the comforts of farm life are well worth while, and publicity campaigns to that end should follow similar lines to those suggested for rural hygiene, all with the view of

securing popular and effective local leadership for moulding public opinion.

COMMITTEE ON TECHNICAL EDUCATION.

There are many papers in the proceedings of the Congress dealing with the subject of Technical Education and its various branches. We have had no time to study them in detail. The question of education is very complicated, reaching as it does from the lowest primary education to the highest technical education. We will, however, comment very briefly on some of these papers.

Report by M. G. Wery on "L'Enseignement pratique de la Mecanique Agricole".—Page 5 of the Proceedings of Section VII.—We are entirely in sympathy with the idea of establishing agricultural schools. Our universities in America have many agricultural colleges which do a great deal to aid the farmer in cultivating and harvesting his crops. Our railroad companies, also, by means of instruction cars, disseminate information regarding soils and methods of agriculture. Agriculture is the foundation of the prosperity of the State, and the war has demonstrated that every country, so far as practicable, should make itself self-supporting.

In Section V of the Proceedings, there are three papers relating to Instruction in Chemistry and Its Application, by M. Kling (page 7), M. Paul Besson (page 28), and M. Bochaud (page 148).

M. Kling discusses the modifications necessary in technical education in France, having in view its adaption to industrial necessities. We are not competent to judge what changes are necessary, because we are not familiar with the present conditions, but we entirely agree with the general conclusions reached by M. Kling.

M. Besson proposes the establishment of a higher school in applied chemistry.

M. Bochaud discusses the reform in technical education in France.

We are cordially in sympathy with any project for improving education in technical chemistry. This subject offers a great field, one that has been cultivated in the past to a large extent by the Germans, but in which France, the United States, and England, are amply competent to lead. One of the results of the war, we believe, will be to take from Germany the superiority which it has hitherto enjoyed in chemistry. In America, our universities have recognized the importance of this subject, and our technical schools have established courses in Chemistry and Chemical Engineering of the highest character. We believe that France should do the same. We will be glad to send to you any further information which you may desire regarding our schools of Chemical Engineering.

Report by M. Kula on "L'Apprentissage".—Page 152 of the Proceedings of Section VIII.—The training of apprentices is very impor-

tant for any country. In the United States, unfortunately, little has been done in this direction. The attitude of the trade unions, which requires the limitation in number of apprentices, is not favorable to the development of skillful workmen or the cultivation of industrial initiative. In this respect, the individualism in France is superior to the co-operation in America, and the result is that the French workmen are, as a whole, we believe, superior in individual skill to the American workmen. They are more expert and better trained. We have much to learn in America from the French in this respect, and we do not feel competent to advise.

In America, little has been done by the State in training apprentices. There are some public schools where manual training is taught, and many night schools and private institutions where trades are taught. As a rule, however, the individual apprentice is left to himself to be trained by his experience in the shop. We, in the United States, need reform in the training of apprentices, but the subject is complicated by the fact that it is intimately connected with the labor problem.

Report by M. Rateau on "Le Developpement a Donner a l'Enseignement de la Mecanique".—Page 83 of the Proceedings of Section III.—With M. Rateau's conclusions we are generally in agreement. The war has greatly increased the interest which has been taken in technical education. It has been a war of engineering. Our young men are thinking now of engineering and its application more than they have ever done before.

However, engineering, that is to say, applied science, offers great opportunities for a young man, not only in the technical branches alone, but in the management of industrial establishments in which engineering operations form the main part. The field and scope of engineering should be brought to the attention of students in the secondary schools, in order that they may know what it means, what subjects it deals with, and what qualities are necessary to pursue it. For most young men, it will offer greater opportunities than the pursuit of the law, medicine, or literary studies. It should be encouraged, therefore, and schools should be provided sufficient to receive all the young men who are properly qualified and who desire to pursue technical studies.

Report by M. Leon Eyrolles on "L'Enseignement Technique Secondaire".—Page 91 of the Proceedings of Section VIII.—The conclusions of this paper are given on pages 117 and 119. With the conclusions of this report we are generally in agreement. The main object of the instruction should be to teach the students to think for themselves. The instruction should be concrete and practical, rather than abstract and theoretical, and should be accompanied by practice in the application of the subjects studied.

We think there is a great tendency in all countries to exaggerate the importance of the work which the school can do. The school cannot

make an engineer. It can teach fundamental principles with which, after having practical experience, a young man will become an engineer.

We believe that a student cannot fully appreciate what he studies unless he can relate it to his experience. If this is correct, the importance of laboratories and of practical experience outside the school is obvious. The object should be to give to the student the fundamental principles in a concrete practical form. Mathematics should be taught concretely, not abstractly, with illustrations drawn from practice.

We entirely approve the suggestion that students in technical schools should be instructed in industrial commerce and in industrial management. Engineering in business and the laws and methods of business should be taught as well as the scientific and engineering principles.

Paper by M. Georges Hersent on "La Reforme de l'Education Nationale".—Page 255 of the Proceedings of Section VIII.—We have read this excellent and suggestive paper with great interest. The conclusions and resolutions are given on pages 271 and 274. We will not take the space to quote them in detail, but we regard them as excellent and would emphasize the following:

> "Que soit favorise par tous moyens le sejour des jeunes Francais a l'etranger des l'age de 15 ou 16 ans;* * *
>
> "D'une facon generale, que les methodes pedagogiques soient inspirees du desir de former le jugement plutot que d'encombrer la memoire;
>
> "Qu' une large place soit faite, dans l'instruction, a l'experience concrete et sensible, de telle sorte que l'enseignement remonte de la realite a l'abstraction;* * *
>
> "Que le personnel enseignant de tous degres soit maintenu en contact permanent avec les progres accomplis hors de France, par des stages prolonges a l'etranger."

We have consistently urged throughout the meetings the desirability of an interchange of students between France and America. We have been struck by the fact that while American students of architecture and the fine arts have in the past flocked to Paris, rather than to any other European city, students of science and engineering as a rule have preferred to go to Germany. We hope that this may be different in the future; but, in order that it may be different, France must offer greater encouragement and opportunity for American students. It is not sufficient for the French schools to admit American students on examination, on the same basis as French students. The student must be judged by his general ability and aptitude more than by the precise studies he has taken, and a system of equivalents must be allowed. Systems of education, and the scope and methods of the different studies, differ in different countries, and a good student from America might not be able to pass a French examination, and *vice versa*. In the past, American students have been admitted to German universities and

technical schools without any examination, if they came with good recommendations from reputable American colleges, and have been allowed to take the courses for which they were reasonably prepared, and the results have been very successful. Thousands of our most eminent scientists, doctors, and engineers have studied in Germany. France, in our opinion, should take a more liberal attitude than in the past, by a system of equivalents and more freedom of studies.

Moreover, France should improve the facilities and equipment of her technical schools, which, we believe, do not now offer facilities even approaching those now offered by many American schools, although the French professors are of the greatest eminence and ability.

As for America, we believe we can assure you that young Frenchmen who desire to study there, will be received with the greatest desire to facilitate their studies and to afford them all possible opportunities.

We believe also that the interchange of professors and assistants, for short periods, would be of great benefit.

In closing, the Delegation sincerely hopes that these meetings have been only the beginning of a more intimate co-operation between the two nations, and that it may be continued and made permanent by the formation of a permanent International Engineering Commission. We feel sure that a suggestion to this end made by your Congress would be met by a cordial and enthusiastic response in America.

J. F. CASE, *Chairman*,
GEORGE F. SWAIN, *Secretary*,
CHARLES T. MAIN,
L. B. STILLWELL,
E. G. SPILSBURY,
N. P. LEWIS,
G. W. TILLSON,
A. M. HUNT.
GEORGE W. FULLER.

APPENDIX II

Report made to the final general meeting of the Congress of Civil Engineering, January 4th, 1919, by M. E. Barbet, General Secretary of the Congress.

Work of the Commissions, with the Co-Operation of the Delegation of American Engineers.

The Permanent Commission of the General Congress of Civil Engineers, when it was informed of the imminent arrival of the best reputed engineers of the United States, prepared the programme for their joint work, eliminating everything that they did not consider worthy of the high ability of their guests.

They retained but five groups of questions, which were made the basis of as many commissions.

The first commission was to consider the investigation of our large commercial ports and the railways or waterways destined to serve these ports.

The second, the great problem of water power, that is to say, the motive power supplied by the streams of our mountains.

The third, the reconstruction of our road system, on a basis adapted for the traffic of heavy trucks and automobiles.

The fourth, agricultural questions.

And, finally, the fifth was to consider the question of technical instruction.

The Congress held in the month of March had adopted important resolutions regarding these important questions, examining them only from the point of view of our national interests. But, it had, from its very inception, manifested the intention of invoking an inter-allied session not only, because in quite a few cases the final solutions are dependent on our relations with our Allies, but also because our friends often have good precedents to be studied and good examples to be imitated or adapted to our requirements.

We are now holding a portion of an inter-allied session with the American engineers, and although this period of joint study must be so short, we are already in a position to measure the value of their co-operation. The United States will use these preliminary studies as a basis to bring to us, with their customary cordiality, the aid of their creative and inventive powers.

Below we submit, in accordance with the memoranda offered by the Presidents of the Sections, the status of the work attained by each of them.

First Section.—Maritime Ports and Inland Navigation.—The first commission held on December 19th and 21st, 1918, two meetings,

M. Bechmann presiding, in the course of which, after a cursory description of the present situation, its defects and the causes to which they should be attributed, the general programme of improvements and complementary work was submitted, which is contemplated by the General Congress of Civil Engineering, both in the principal ports (Dunkirk, Havre, Seine Maritime, St. Nazaire, Loire Maritime, Gironde, Marseilles) and in our inland system of navigation, which calls for a more perfect utilization of our great rivers (Seine, Loire, and Rhône), a more complete homogeneity of our system of waterways, the establishment of various new lines of transportation, the creation of some lines of unusual profile, not to mention the questions of organization and exploitation, such as autonomy of the ports, future creation of free zones, intervention of private initiative under various aspects, etc.

There was also an exchange of opinion on various points, which arose in the course of discussion, namely, the prospective sizes of the largest sea-going steamers of the near future, the construction and equipment of the ports, the respective rôle to be played by the waterways and the railways, the order of priority of the work to be undertaken, etc., etc.

The inspection of the "Maritime Loire" and the ports of Nantes and St. Nazaire, on December 27th and 28th, 1918, permitted the elucidation of the questions relative to this region, which seem particularly adapted to serve the traffic between the United States, France, and Switzerland, and to start the examination of the questions with regard to future co-operation of American engineers and financiers.

The next excursion to Marseilles and to the "Etang de Berre" will permit of the resumption of the discussions and the further consideration of the resolutions still pending.

Second Section.—Water Power.—The Section or Commission first heard the report of the "Hydraulic Power Department", describing the resources of the country in hydraulic power.

A part of this power was utilized before the war. Despite the greater difficulties which impeded the utilization of the falls during the hostilities, the percentage of the utilized water power has been considerably increased, but it is intended to push the utilization of electric power very much further, and, in particular, to use it for the electrification of railways.

The Section or Commission then reviewed the large plans now under consideration, contemplating the development of power on the Rhône, the Durance, and the Dordogne Rivers. It first of all recognized the work of General Inspector de la Brosse, whose name is connected with all the successes of French hydrotechnics and of the works resulting therefrom.

In regard to the Rhône, M. Boissonnas summarized with remarkable clarity the various questions, which arise from its utilization, on the one hand for the utilization of the water power of the Upper Rhône and, on the other, to facilitate the traffic between the Mediterranean and Switzerland. He did not forget to mention the irrigation along its course, which would confer prosperity on neighboring regions.

Special conferences were arranged between the French engineers and their American colleagues, so that they could exchange opinions in regard to the great problems arising, while looking at the plans.

The visit which is to be made to Grenoble will make it possible to go more deeply into all these questions, in regard to which no conclusion can be arrived at until our return.

In a second meeting, the Commission very particularly studied the electrification of the railways, and considered in regard to this subject the information supplied by our American colleagues, since in the United States this electrification has already commenced.

Finally, this very morning, a third meeting was devoted to the study of projects relative to the Durance River. The present conditions will prevent the American Delegation from visiting the high valleys of the Durance, but M. Marliot, in a very clear technical lecture, explained the works under preparation. In Marseilles, the orographic plans in relief will complete the explanation and will render it still more impressive than simply an uncomfortable voyage to the spot would do.

Third Section.—Reconstruction of the System of Roads.—This Commission unanimously adopted the following conclusions:

1. The macadamized road which has hitherto sufficed for interurban roads, is being rapidly worn out by the automobile traffic. It is no longer adapted to this kind of traffic. The tar surface, which has no doubt been a preventive against dust, is very deficient in preserving the surface of the road against the wear and tear resulting from the traffic of automobile vehicles.

2. New modes of construction have been experimented with. Among them should be mentioned concrete and bituminous surfaces and brick pavements. The experience of a number of years suffices to teach us that the selection to be made between these various systems of construction depends on a number of facts: climate, intensity of traffic, cost, etc. The brick pavement used in America can only be used in France in exceptional cases. The concrete roads can only be recommended as practical in the countries where the materials entering into their composition are found on the spot and at advantageous prices.

3. The bituminous or asphalt roads are, unfortunately, very expensive, but they have the advantage that the cost of maintenance is less

than that of macadamized roads. The intensity of traffic being equal, they answer very much more satisfactorily the requirements of automobile traffic.

4. The cost of these roads is considerably lessened if the surface is used on top of a macadamized road, the old ballasting of which constitutes a good foundation.

5. The reconstruction of the French system of roads is rendered necessary by the great deterioration resulting from the traffic during the war. It would be a mistake to construct it again as it was before, as it could not resist the automobile traffic which is bound to increase greatly in the future, in order to take care of the industrial and commercial requirements and the requirements of tourists, and the necessary expenses of maintenance of which would increase considerably, without being satisfactory to the users of the road. Fortunately, the greater part of the French roads can serve as excellent foundations, and it will suffice to give them a suitable surface (wearing) covering, and under these conditions the roads can be adapted to the new requirements which will be made on them, without too great expense.

It is logical to have the cost of the improvements and maintenance of the roads defrayed by all those who use them and by the owners of adjoining property who profit from the traffic. This principle has been admitted and applied in certain foreign countries, permitting of the issuing of bonds for the repair of the roads, on the security of the taxes and the assured revenues, which increase as the traffic becomes greater; as, for instance, the taxes on automobiles, on gasoline, etc. Unfortunately, the fiscal legislation adopted in France does not permit of the application of this procedure, and as voluntary contributions cannot be depended on, it is necessary to apply to the State, to the Departments, and to the Communes, for the necessary appropriations to place our system of roads in a condition to satisfy the new requirements.

However, if the State, the Departments, and the Communes cannot find the necessary capital, private enterprises can be formed to carry on the construction of certain well-chosen roads, guaranteeing the maintenance for a certain number of years by means of an annual charge made up of the former annual maintenance charge increased in view of the present higher costs, and a further amount justified by the improvements effected.

Although this process may cost more than the direct construction by the public authorities, it will perhaps be necessary to resort to it, owing to the circumstances created by the war.

An investigation of the financial question must therefore be pursued in the later discussions with the help of those who are qualified to give useful advice.

The eminent President of the Section, M. Heude, did not allude at all in his summary to the paved roads, because this is a well known system and its original construction is quite expensive. But is it not worth more, in certain cases, than the concrete or bituminous forms of construction?

In the north of France, where farming trucks play so important a part, there are a large number of paved roads, the cost of which was apparently reasonable. Our recent visit to Arras, Lens, Bapaume, and Albert has afforded us opportunity to see that, even after the war, the paving was still in good condition, with an excellent surface, while the macadam was terribly worn.

Fourth Section.—Agricultural Reconstruction.—The basis of agricultural reconstruction is primarily the financial question, and the Commission has devoted almost two sessions to this important problem.

I request permission to emphasize somewhat the results of the discussion, for the financial problem is almost the same in regard to industrial, naval, and highway reconstruction, etc.

Commercial credit, limited to 90 days, absolutely does not suffice the farmer, who must await the payment for his harvest, in order to be able himself to pay for fertilizer, seeds, implements of husbandry, etc.

Our law of March 19th, 1910, has therefore been very wise in establishing for farmers the long-term credit, but it must not be forgotten that, on the one hand, this credit is based on a mortgage and that, on the other, the loan cannot exceed 8 000 francs. In a word, this loan applies only to the small farmer, who alone is able to derive benefit from the law.

In the United States, the farmer can borrow by giving a mortgage not only on his land, but also on the personal property which he owns or which he will own from the proceeds of the money loaned. He borrows on his farming implements, on his live stock, on his next harvest, this being accepted as security either in the ground or even after it has been placed in the barn, and without obligation to turn over to the lender the property pledged. In this manner, he is not compelled to sell his grain as soon as the harvest is completed. He can wait for more favorable rates and does not run the risk of being involved in financial difficulties.

As to the lender, he is protected by an extremely severe law, which punishes by a fine and prison any abuse of confidence, whether the debtor wrongfully transfers a part of the security, or whether he borrows several times on the same security.

Finally, even if he borrows on a mortgage on landed property, the debtor retains the right each year, beginning with the fifth year, to clear off the mortgage by prepayment.

These are measures which our French law would do well to imitate without delay.

The security on basis of the harvest permits the dealer in fertilizers to allow 8 or 10 months for payment. It is an individual, guaranteed credit. But, in order that the dealer in fertilizers may be able to do this it is necessary that he, on his part, should have the money, so that he must be able to get credit from a bank, which will advance him the necessary funds after examination of the mortgage transaction, for which he remains responsible.

It is therefore necessary that a bank should be ready to loan money, not for 90 days, but for a very much longer time, or for at least 1 year.

The same remarks apply to the manufacturers of agricultural machines, who are obliged to stock up and who cannot sell except on long payment terms.

Finally, a still longer term is required to assist the large agricultural industries (sugar refining plants, distilleries, breweries, etc.), or to establish new manufacturing plants, to use more modern processes: industries for the supply of meat, based on cold storage; industries for the preservation of perishable foods by drying; industries of canned goods, preserves; rational wine-making industries, production of the syrup or juice of grapes, apples, and other fruits, etc.

For all these industries, credit up to 8, 10, or 12 months no longer suffices. Terms of 4 or 5 years are required, and, consequently, the banks must obtain money which they will not have to repay for 4 or 5 years.

A bank, as a matter of fact, must not tie up its capital, which is the basis of its operations. It can only lend for a given term the money which it receives on deposit for a like term.

Let us consider once more the example of America. Aside from the credit extended to small farmers, there has been established in each State banks of a higher class, which supply money to the manufacturers and to the various agricultural industries. Their working capital (long-term) is in greater part supplied by the State itself. For certain kinds of loans, the rate of interest demanded by the bank must not exceed by more than 1% that on the money paid by the State. We may remark in passing that we see here a precedent for the kind of special bank which we supported before the Congress with the assistance of MM. Victor Cambon and F. Mainie.

Would it be difficult to do the same here in France?

Nothing has been more favorably received by the public than the 3, 6, or 12 month treasury bonds. Why does not the State issue some redeemable in 2 and 5 years. Their popularity would be still more increased, if their transfer between private parties should be authorized, as true bank notes, making it possible to use them as legal tender. The funds resulting from the issuance of such bonds would be transferred to the Grand Agricultural Bank at a rate slightly higher than

that of the bonds themselves, so that the operation would remain lucrative for the State, and it will be seen that in this manner the Agricultural Bank would have all the financial resources which our agricultural reconstruction would demand.

In regard to the guaranteed capital of the bank, it would be constituted by the payments which the Bank of France has agreed to make annually by virtue of the law which confirmed the extension of its privilege to issue bank notes.

The Commission did not think it advisable to go into further details, nor, in particular, to specify rates of interest. It suffices for the present to show in what a very simple manner it would be permissible and lawful to obtain the inexhaustible resources for the powerful bank which we require for the furtherance of agriculture, in order to adapt it for modern industrial conditions. The millions, and even the milliards, which would be necessary, will be furnished eagerly, we might say, by the public, which will be glad to contribute its money for the farming industry if it can avoid running any of the risks ordinarily involved.

Let us repeat, parenthetically, that this same financial method could be applied in the case of all our other industries—mechanical, electrical, etc.

The Agricultural Bank, by its long-term loans, would provide the means to restore in the north of France our old farming industries or to establish new ones in the other parts of the country. It would also assist in creating manufacturing plants to use more recent processes, which could increase to a great extent the profits of agriculture.

It may in fact be stated that if, among the food products of our soil, there are some which are ready for consumption without preliminary preparation, there are, on the other hand, many others which require a preliminary treatment and that such treatment, according as it is simple or highly perfected, will result in products which are either cheap or of extraordinary value.

Consider wine as an example: The juice of the grape requires a special kind of process, namely, fermentation. But whereas the grape, made to ferment by the wine-growers without instructions and without the proper equipment, gives poor wines which, after a few years, sell for less than 5 francs per hectoliter, we see this same grape, treated scientifically by the large champagne houses, producing regularly, unless there are bad years, wines valued at more than 5 francs per bottle. The value given by the scientific process is a hundred times that of the other. A good part of this profit goes to the grower, for a hectare of vineyard in Champagne has a different value from a hectare in the Herault.

The American engineers who went to Nantes, visited the wine establishment of M. J. Bruno, where they tasted one of the most agree-

able champagnes, although it was produced from a very common vine of Algeria and Spain. This result was obtained by very careful technical supervision, beginning with removing from the juices the bad odors of the soil, eliminating the low ferments, and allowing them to ferment at a low temperature with the higher ferments of Champagne. In this manner, it is quite impossible to discover their origin.

Still better, the industry is in a position to concentrate the juice of the grape, the apple, or any other fruit, in a vacuum, and thus produce syrups which can be kept for an indefinite length of time.

In this manner, internal transportation as well as exportation are very economical, since weight and volume are reduced to less than a fourth. Finally, one can store the excess or surplus of abundant harvests, and put them on the market in the years when the harvest is poor. In other words, warehousing is established—a necessary basis for large commercial operations.

In regard to meat, storage is no less desirable in order to stabilize prices. Here, also, applied science solves the problem, based on the application of artificial cold. We owe this industry to the genius of a Frenchman, Charles Tellier, who invented the refrigerating machine and its utilization for the conservation of perishable foodstuffs. Meat is the most important of all, and Charles Tellier constructed the first ship provided with refrigerating plants, to bring to Europe the meats from Argentine or Australia.

France, nevertheless, permitted herself to be greatly distanced by the United States and by England. To-day, we must perforce make up for time lost, and for this it is first of all necessary to create cold storage warehouses in all the cities of France. At the same time, slaughter houses or packing plants can be installed in all the cattle-raising centers, this new agricultural industry finding its regulating market in the cold storage plants in the cities.

The Fourth Section has studied in detail, as was done by the Congress, this entire new organization, the technique of which has been entirely developed, but which, for its proper exploitation, only requires the assistance of enormous funds. This will be one of the first tasks of the Agricultural Bank. Everybody recognizes to-day the enormous advantages which will result herefrom for our agricultural industry.

Finally, based on a report by M. Coupan, with many references, the Fourth Section took up the question of agricultural machines, meto-culture, the enormous need of fertilizers, and notably the synthetic manufacture of nitrates, the disinfection of the soil (by formol, for instance), etc. It was recognized that the example of America was of the greatest interest for the standardized manufacture of all agricultural machines and for the specialization of the producing plants.

We have every hope of an intimate collaboration with our American friends in regard to all these agricultural questions, which our diffi-

culties in the way of food supply places foremost to-day in our thoughts.

Fifth Section.—Technical Instruction.—Inaugurating the sessions of the Commission, the President, M. Hersent, recalled that the object of these meetings was to permit an exchange of opinions, suggestions, and methods in regard to the principal problems of interest for the economical future of the two countries. The question of technical instruction and information takes first rank among these. The years to come will necessitate an enormous effort in production. Now, the productivity of a country depends essentially on the quality of the individuals devoted to the productive industries in all branches of the economic structure. Owing to the dearth of labor which the war has produced in almost all the belligerent countries, the problem of professional training has assumed importance for the entire world. A study of the methods pursued in the various countries, therefore, would be very desirable; and from this arises the interest in sessions such as have been held by the Congress.

It will, however, not be possible to take up the problem of professional education as a whole. It will be wise to restrict ourselves to a few special points.

M. Kula contributed a concise and clear memorandum in regard to the technical training of the laborer. This education should commence with the primary school.

But the true school of technical training must be the school of preliminary apprenticeship, such as the one in Paris, in the rue des Epinettes, which constitutes the bridge between the primary school and the private workshop.

The preliminary apprentice is already a laborer, but the preliminary apprenticeship does not specialize. It is a general education, the purpose of which is to impart to the child a liking for manual work.

Professor Swain states that the problem of education has become universal. It is to be encountered in the United States as well as in France, in particular as regards technical education. He believes that the French education gives too much emphasis to general education, to the detriment of manual and practical training. Laboratory and shop instruction has been used to a certain extent in the United States, but much remains to be done in this direction, especially in the elementary schools, which should direct the child toward a vocation, but Professor Swain insists on the danger attendant on specializing too quickly. He believes that Americans have as much to learn in France as the French have in the United States.

There is no law in force in America in regard to apprenticeship. The régime of absolute liberty prevails. When the worker considers he has learnt sufficiently in a workshop, he goes from enterprise to

enterprise to advance himself. The labor unions sometimes restrict the number of apprentices, in order to avoid a reduction in wages. Furthermore, is excessive use of the "Taylor" methods detrimental to apprenticeship?

In closing the first meeting, M. Hersent stated that the problem, after the war, would be to bring about large production, accompanied by high wages, and this despite a deficit of 3 000 000 workers. The solution could only be found in a serious preparation of the producers for their vocations. Exchange of ideas along these lines could not but promote the solution of the question.

The second session took up the question of technical instruction, secondary and higher.

Professor Swain stated that, in America, the principle of some specialization in secondary instruction is generally recognized as advisable. On the other hand, in the higher engineering schools, there is a tendency to specialize to too great an extent, and a reaction seems probable.

In regard to the desire to have the instruction of the French directed from the beginning of school life toward industrial questions, M. Hersent insists on the necessity of beginning vocational training at an early age, and of making in high school or college a differentiation between students who are likely to profit by classical training and those who are not, so as to direct the latter immediately toward the practical vocations.

The opinion of the Committee was unanimous in regard to the necessity of introducing some manual training beginning with the secondary school.

Professor Swain agrees with the Congress in the necessity of rigorous discipline in habits and methods of the work of the pupils in secondary technical schools. Severe penalties should be imposed for poor work or lack of application. The academic freedom which prevails in many universities and colleges is detrimental to the training of engineers.

Mr. Hunt explained that the systematic training in workshops, referred to in the Thirteenth Resolution of the Congress as following the school instruction, is not usual in the United States, except during the vacations. But certain universities (Cincinnati, Pittsburgh, Boston), and certain chemical schools have tried the experiment of combining studies in school with experience in the shop. The pupil passes alternatively a number of weeks in the school and a like number in the shop, and the results appear to be successful. For this purpose the classes are divided into two parts, so that the technical instruction and the practical instruction are continuous, both in the school and the shop.

A very animated discussion took place in regard to sending American students to France, and *vice versa*.

Professor Swain complained that France had not systematically sought to attract American students, as the Germans had done with great success. We must freely open the doors of our great schools and universities. But the most important thing to do is to facilitate in a practical manner the attendance of American students at high schools in France.

The work of the Fifth Section found an interesting illustration in the visit which was made yesterday to the Central School of Arts and Manufactures, and in the preliminary views which were exchanged.

M. Noel Senator, Director of the School, explained the principles followed in the training of the engineer for industrial occupations. A thorough, general education first in the "lycée" (secondary school), an admission examination for the "Ecole Centrale", tending to eliminate all those not capable of assimilating the higher instruction given in the school—applied science during the first year and higher technology during the other two years. Finally, the obligation for all the students without exception to acquire the technical knowledge which is indispensable to all specialized professions: industrial physics (heat and electricity), the various forms of motors, the construction of industrial structures, the quality of materials and the methods of use, methods of manufacture and transportation, highways and railroads, etc.

Our engineers have a good general training in engineering, and whatever specialty they finally take up, they become competent in a very short time, and capable of rendering valuable services in rapidly improving their industry.

The French method is exactly the reverse of the German method, which does not produce anything but outrageously specialized engineers, who are incapable of breaking away from their original specialization and who are little prepared for the great modern inventions, for these can very rarely succeed, if the inventor is not capable of figuring for himself the forces and power which he will require, or of translating into material and suitable devices the conception of his mind. Maj. Case and Professor Swain submitted the proposition that there be made possible between the United States and France an exchange of students of engineering, stating that already in their country the *beaux arts* (architecture, painting, sculpture, and music) have used and profited much from the French schools, and that the same should be true in engineering, and that, on the other hand, the original and daring methods pursued in America, the intensiveness and rapidity, and the principles of the Taylor system, would give a favorable impulse to our great industries.

These just remarks did not escape the Congress of Civil Engineering, and it was even commented on to what extent Germany, always prompt to lend itself to anything promising it profit, had attracted to itself the students of the Balkans, Italy, and other countries, by lavishing on them diplomas little merited. The competition of the cheap German diploma has injured the foreign *clientele* which we have been accustomed to see in our schools, for the foreign student forms friendly relations with the country which receives him, and when he returns to his own country, he becomes its customer and business correspondent.

It cannot be imagined to what extent this obscure cause has promoted the economic expansion of Germany. We must try to protect ourselves from this, and the suggestion of our American colleagues is quite in line with our desires. It should obviously be generally observed in all the allied countries.

Such is, roughly, the present status of our labors together. The trip, which is to commence this very evening, to Grenoble for the study of the utilization of electric power, to Marseilles to study the harbor, to Lyons to study the future development of this industrial center and the practical utilization of the Rhône as a source of power and as an artery of communication, will contribute somthing new to our studies. It is also proposed to have a new session of the sections on the return from this excursion. The final conclusions can then be examined, and the basis laid by which the aid of America, so cordially offered, can be availed of in every direction of our reconstruction. May our distinguished guests receive at this time the assurance of our respect for their technical experience and our gratitude for their valuable collaboration.

Excursion to Lens.—The privileged few who took part in the excursion to Lens in the company of the American engineers brought back from this voyage an impression of horror and vigorous hate. It is impossible to express the feeling of anguish which seizes one in traversing these regions, once animated and flourishing, and to-day deserted and showing nothing but ruins and the débris of war material.

At Arras our guests commenced to see clearly that the German shells were concentrated intentionally on the heart of the city, so that nothing should remain of the architectural beauty of which Arras was so proud, no trace of the town hall, the two great Flemish structures, the Cathedral and the Convent of St. Vaast. It will be necessary to destroy what still remains standing of these buildings.

After having contemplated from the top of the famous Vimy Ridge, the scene of the great Canadian victory, the visitors arrived in the district of Sallaumines, Lievin, Lens, which had been injured infinitely more than Arras. Not a wall remained standing. It is the most terrifying chaos that can be imagined, and an engineer naturally begins at

once to think of means by which this mass of wreckage could be removed, which has become dangerous on account of the corpses entombed there, as well as on account of the numerous grenades and shells. Almost a 1 000 000 cu. m. must be cleaned up and carried away. This will not only require an enormous amount of labor, but will correspondingly delay the urgent work of agricultural and industrial reconstruction.

However, we must admire the indomitable energy of our dear and venerated Honorary President, Reumaux, and his eminent colleagues; instead of abandoning all hope in this Dante-like hell, they have already prepared their plans of attack. They will require two years for cleaning up alone, but from the ruins they will secure the materials for the concrete with which they will build 1 000 houses in 1919, and then 2 500 per year until the work is complete.

And the whole world says: The Huns are intoxicated with the pleasure of destruction; they have satiated themselves in the orgy of devastation. It is surely their duty to clean up the results of this orgy. It is for them to come and live in this inferno and incur the risks involved in the clearing up.

What I have stated of Lens applies to all the other ruins which require to be cleared. It would be in the highest degree immoral and unjust to permit the Huns to employ from now on their working population in their own uninjured plants, and to push to the maximum their manufacturing productivity, while we, our labor so impoverished by a barbarous war, in which we have suffered most, should be handicapped for two years by under-production, which renders living so expensive.

It suffices to state the problem in this way, to show that no juridical sophism should prevent us from imposing this forced labor on the vanquished, even after the conclusion of peace, and it will be found that this is a mild punishment for such crimes.

Our American guests add: "No peace plenipotentiary should be admitted to the Conference without having first made a pilgrimage to Lens and other scenes of Hun methods. That is the only way for them to gain the viewpoint to enable them to judge what terms should be imposed on the vanquished and what guarantees should be taken for the future."

In regard to the restoration of the coal mines, which, before the war, furnished up to 8 000 000 tons of coal (almost one-fifth of the French production), it is estimated that it will take about two years to unwater them, and that this will require the installation of 30,000 h. p.

Photographs will be shown you in a few minutes, representing the plants before the war and their present condition. You can judge for yourselves.

APPENDIX III

JANUARY 29TH, 1919.

REPORT SUBMITTED BY THE DELEGATION OF AMERICAN ENGINEERS TO FRANCE TO THE FOUR NATIONAL ENGINEERING SOCIETIES

Pending the completion of its formal report, the Delegation of American Engineers to France submits the following statement to the National Societies which it represents:

The French "Congrés Général du Génie Civil," at its meeting on January 15th, 1919, adopted the following conclusion:

"In order to study both the possibilities and the means of co-operation which have been considered between the engineering societies represented by the members of the American Delegation and the representatives of the French Civil Engineers, it would be highly desirable to maintain the contact which has just been established.

"For this purpose the formation of a permanent Franco-American Committee should be the first result of the studies and trips of inspection which have just taken place.

"The American Delegation and the delegates of the 'Génie Civil' unite in expressing a resolution in favor of the immediate formation of this permanent international committee."

A formal resolution to this effect was passed by the Congress, without dissent.

The French members of such Permanent Committee were appointed by the Congress, consisting of the General Secretary and the Presidents of the five Sections or Committees with whom the members of the American Delegation had been closely working since their arrival in France, *viz.*:

The Committee on Ports and Navigable Waterways
" " " Water Power
" " " Roads
" " " Agricultural Development
" " " Technical Education

The members of the American Delegation were requested by the French engineers to act as the American members of the Permanent International Committee. The Delegation declined to do this, explaining that it represented the four National Engineering Societies of America, to which Societies it must report, and in whose hands any permanent action must lie.

To meet the desire of the French engineers, however, for the immediate creation of an International Committee, and in view of the fact that the Delegation still has some work to do in preparing reports and information for transmission to the French Committee, the members

of the Delegation consented to act temporarily as the American members of the International Committee, promising to bring the matter to the immediate attention of the Societies they represent, and to secure immediate action if possible.

In view of these facts, the American Delegation, at a meeting held January 27th, 1919, unanimously passed the following resolution:

"*Resolved*, that the Delegation bring to the immediate attention of the National Societies, which they represent, the facts with reference to the formation of a permanent Franco-American Engineering Committee, and urge on the Societies that they take immediate action to constitute the American representatives upon such a Committee."

(*Signed*) GEORGE F. SWAIN,
LEWIS B. STILLWELL,
CHARLES T. MAIN,
A. M. HUNT,
GEORGE W. FULLER,
E. GYBBON SPILSBURY.

ITEMS OF INTEREST

The Committee on Publications will be glad to receive communications of general interest to the Society, and will consider them for publication in *Proceedings* in "Items of Interest". This is intended to cover letters or suggestions from our membership covering matters which are not of a technical character. Such communications, however, must not be controversial or commercial.

Report of the Finance Committee to the Board of Direction, June 16th, 1919.

JUNE 12th, 1919.

BOARD OF DIRECTION
AMERICAN SOCIETY OF CIVIL ENGINEERS.

GENTLEMEN.—The Finance Committee of the Board, at a meeting at which the majority of the Committee was present, decided unanimously to recommend to the Board what we consider to be moderate increases in salaries of members of the clerical staff, as recommended to us by the Secretary of the Society in a letter addressed to the Chairman of the Committee on May 21st, 1919, accompanied by an interesting analysis of the increase in the cost of living during recent years. We recommend also that payments to Mr. McMinn be provided for through a budget account independent of that for clerical help.

There was referred to the Committee on April 14th, 1919, the question of further contribution by the Society to the cost of recataloguing the library. The majority of the Committee has made a personal examination of the present catalogue system and has discussed the matter in detail with the Librarian, Dr. Craver. Admitting that the catalogue of the 67 000 volumes belonging to the Society, which were transferred to the Engineering Societies Library, may have been more thorough and complete than those of the libraries of the other Founder Societies, we are convinced that one complete catalogue should be made, and that this work should be done as soon as possible. We believe also that the Board should no longer defer favorable action on the request for a contribution for this purpose, but that it should appropriate the sum of $2 500 therefor, the same sum as that provided by the other three Founder Societies. This recommendation is made in the expectation that at least as much more will be called for as our contribution to the cost of this work.

Respectfully submitted,
Finance Committee,
NELSON P. LEWIS, *Chairman,*
H. S. CROCKER,
GEORGE H. CLARK.

New Filtration Plant for Sacramento, Cal.

Charles Gilman Hyde, M. Am. Soc. C. E., Professor of Sanitary Engineering at the University of California, has been employed by the City of Sacramento as Consulting Engineer in the construction of a water filtration and pumping plant, for which bonds to the amount of $1 800 000 were voted by the people in June, 1919.

Until recently Professor Hyde was in the United States Army service, having been commissioned Major in the Office of the Surgeon General, at Washington, D. C., and having served in that capacity for more than a year. He has had extensive experience as a water supply engineer. Fifteen years ago he designed the filtration plant at Harrisburg, Pa., and acted as Consulting Engineer during the period of construction.

The filtration plant at Sacramento is to be of the mechanical or rapid sand type, filtering the water of Sacramento River. Its nominal capacity will be 30 000 000 gal. per day, and sulphate of alumina will be used as the coagulant. This will be the first modern municipal filtration plant in California and is expected to be in operation early in 1921.

For more than 50 years, Sacramento's water supply has been unfiltered, and at times it has been so turbid and muddy that it could hardly be used. The decision of the people to build a filtration plant was the result of recommendations made by Professor Hyde, and Messrs. George H. Wilhelm and Frank C. Miller, in 1916, after they had made a diligent and exhaustive investigation of all possible sources of water supply for Sacramento.

Committee on Honorary Membership

At the meeting of the Board of Direction held in Minneapolis, Minn., on June 16th, 1919, the following gentlemen were appointed a Committee to nominate those considered eligible for Honorary Membership in the Society: President F. S. Curtis; Past-Presidents Chas. D. Marx, Clemens Herschel, Geo. H. Pegram, and A. N. Talbot; Vice-Presidents Nelson P. Lewis, Leonard Metcalf, John F. Coleman, and Herbert S. Crocker.

The James Watt Centenary

Appropriate ceremonies will be held at Birmingham, England, on August 25th, 1919, to celebrate the centenary of James Watt. J. P. O'Donnell, M. Am. Soc. C. E., of London, was appointed by President Curtis to represent the American Society of Civil Engineers at the celebration. Illness, however, will prevent Mr. O'Donnell's attendance, and he has asked Sir James Ball to take his place.

Report of the Library Committee, on the Engineering Societies Library, to the Board of Direction, June 16th, 1919.

JUNE 3d, 1919.

TO THE BOARD OF DIRECTION:

All the functions for the Library Committee prescribed by the Constitution have for years been performed by the Secretary of the Society. It remains, therefore, for your Committee to report the actions of the Engineering Societies Library Board, on which it represents the Society.

Since January 1st, 1919, two actions of unusual interest and prime importance have been taken: (1) to recatalogue and shelve as one homogeneous library the several collections of books brought together by the Founder Societies; (2) to use the system of cataloguing and indexing developed by the Institut International de Bibliographie, which is the Belgian extension of the Dewey Decimal System prepared under the direction of Paul Otlet, of Brussels, General Secretary of the Institut.

Cataloguing of new material by this system has been in progress for many months as part of the routine work of the regular Library Staff. It has, however, been impossible for this Staff to devote the necessary time to recataloguing the older books, including a miscellaneous accumulation of books and pamphlets which had never been catalogued. As has been stated to the Board in other communications, the Director of the Library estimates that two years' time of a special force will be required for this work, and that the total expense will be about $25 000. On recommendation of the Library Board, United Engineering Society requested the Founder Societies to provide $2 500 each per year for two years. Three Societies have already voted this special appropriation. Because repeated and urgent requests have been made that the recataloguing should proceed without further delay, and because money from some of the Societies has become available, the nucleus of a special force was put to work on May 1st. This force will be increased, and the work pushed more vigorously as the methods are developed.

On June 1st, 1919, the Engineering Societies Library contained about 200 000 books, of which 18 774 had not been catalogued at all. The number of visitors has averaged about 78 per day, since January 1st. This Library is more than a collection of books. Through its Service Bureau persons at a distance can use information on its shelves. Searches are made in response to mail or wire inquiries, bibliographies, photostat copies, translations, and abstracts being furnished at cost, and many questions answered without charge. Last year more than 1 700 orders were filled, many of them from remote places. For this work $10 000 were received. For the first five months in 1919, there have been received 1 329 orders for which the charges amount to about

$7 900. Since October, 1918, an index of current technical literature has been prepared monthly by the Library, in co-operation with the staffs of the Founder Societies. This index is printed in their publications in part or whole and by a few other Societies which have made suitable arrangements.

Respectfully,
JOHN A. O'CONNOR,
ARTHUR P. DAVIS,
WILLARD BEAHAN,
CHARLES WARREN HUNT,
ALFRED D. FLINN, *Chairman.*

Founder Societies' Finance Committee on Joint Activities

For the purpose of acting on matters of mutual interest involving the expenditure of funds, there has been set up a Founder Societies' Finance Committee on Joint Activities composed of the following:

American Society of Civil Engineers.—Nelson P. Lewis, Chairman, Finance Committee, and Dr. Chas. Warren Hunt, Secretary.

American Institute of Mining and Metallurgical Engineers.—J. V. N. Dorr, Chairman, Finance Committee, and Geo. D. Barron, Treasurer.

American Society of Mechanical Engineers.—W. E. Symons, Chairman, Finance Committee, and Walter M. McFarland. Secretary Calvin W. Rice is also expected to attend the meetings of the Committee.

American Institute of Electrical Engineers.—N. A. Carle, Chairman, Finance Committee, and F. L. Hutchinson, Secretary.

Society *Transactions* for Sale

R. S. Coleman, 314 Federal Building, St. Paul, Minn., administrator of the estate of the late Clarence Coleman, M. Am. Soc. C. E., wishes to dispose of certain volumes of *Transactions* forming a part of the estate. The set is nearly complete and consists of 83 bound volumes for the years 1873-1917 (except 1885) and three volumes of indices. The first 31 volumes are bound in sheepskin and the remaining 52 volumes and three volumes of indices are bound in half morocco. All are in excellent condition and are now in book cases in the United States Engineer Office, Duluth, Minn. The price of the 83 volumes is $100 f. o. b. Duluth.

Committee to Recommend the Award of Prizes

President Curtis has appointed as a Committee to Recommend the Award of Prizes of the American Society of Civil Engineers, Messrs. A. S. Crane, M. Am. Soc. C. E.; Ralph Modjeski, M. Am. Soc. C. E.; and Arsène Perrilliat, M. Am. Soc. C. E.

Report of the Committee on Special Committees, to the Board of Direction, June 16th, 1919.

To the Board of Direction:

Gentlemen.—Your Committee on Special Committees has been in correspondence with all the Chairmen of the Special Committees as now appointed.

Committee on Development.

The Chairman of the Committee on Development, though claiming that his Committee does not come under the class of Special Committees designated in Article 6, Section XII of the Constitution, reported to date of May 29th, 1919, by enclosing a copy of a preliminary report, and stating that, since that time, the Committee had been working along the lines indicated in that report; that a five-day meeting had been called to be held from June 11th to 16th, 1919, in Minneapolis, Minn., at which time it was expected a general progress report would be made to the Board of Direction; expressing the hope that the Committee would be able to supply the Board at the opening meeting of the Convention on June 16th, with copies of its progress report, sufficient in number for distribution to members present; and suggesting that the Board arrange a time for the discussion of this progress report.

The Committee on Special Committees suggests that this be done, and that the Committee be continued in order that it may conclude its investigations and render a final report in time for presentation before or at the Annual Meeting of this Society.

Committee on Reconstruction.

Nelson P. Lewis, Chairman of the Committee on Reconstruction, advises that this Committee will submit to the Board of Direction its Final Report and ask to be discharged at the Minneapolis meeting.

Inasmuch as a National Service Committee has since been established by Engineering Council, with headquarters in Washington, D. C., representative of all branches of the Engineering Profession, the objects for which the Reconstruction Committee was created appear to have been accomplished.

The Committee on Special Committees, therefore, reports in favor of approving the discharge of the Committee on Reconstruction.

Special Committee to Codify Present Practice on the Bearing Value of Soils for Foundations.

Robert A. Cummings, Chairman of this Committee, reported verbally on June 7th, 1919, that the work of the Committee had been interrupted by the war, and that little had been done; that during the Spring, work

had been resumed actively and was now in progress; that while no Progress Report might be ready for the Minneapolis meeting, results might be expected at the next Annual Meeting of the Society. Mr. Cummings further reported that extensive and interesting tests had been made by the Bureau of Standards, in co-operation with this Committee, which will be of great value to the Society, and that the work should be continued.

The Committee on Special Committees concurs in the view that the Committee should be continued.

Special Committee on the Regulation of Water Rights.

F. H. Newell, Chairman, has been written to twice by the Chairman of the Committee on Special Committees, for information as to the work of his Committee, but, so far, no response has been received.

It is believed that little work has been done by this Committee, especially since the war has claimed the activities of its members.

Your Committee on Special Committees makes no recommendation at this time, but raises the question whether the object sought in the appointment of this Committee and to which it is addressing itself, is not impossible of accomplishment? If so, it would appear unreasonable to ask continued service of the members of a Committee in a field with such serious, if not insurmountable, legal and practical difficulties as here prevail.

Special Committee on Stresses in Railroad Track.

A. N. Talbot, Chairman of this Committee, advises that since its Progress Report at the Annual Meeting, the Committee has held a meeting at Chicago, Ill., in March, and discussed plans. It has been planned to hold another meeting sometime after the data of the tests have been presented to it. During 1919, the staff of the Committee has been working on the data of the tests accumulated in 1918. This work has taken more time than was expected, but it is now thought that the material will be ready for the Committee by the middle of this summer. These results include information on the effect of counterweight of locomotive on stresses in the rail, loads on and stresses in ties, and the transmission of pressure through ballast to roadbed.

It is believed by the Committee on Special Committees that the Committee on Stresses in Railroad Track is pushing its work with all possible diligence, and should be given such time as is needed to complete its work.

Special Committee on Roads.

Your Committee on Special Committees to which was referred the request for the appointment of a Special Committee on Roads or High-

ways, has conferred with a number of members of this Society closely in touch with the pending projects of the Government in this engineering field, with the work being done by the authorities at Washington, D. C., the Bureau of Public Roads, the Association of Highway Officials, the American Society for Testing Materials, and others, and with the past and present efforts of this and other Societies to assist in an advantageous solution of highway problems.

A digest of the arguments for and against the appointment of such a committee can be submitted if desired by the Board of Direction.

Your Committee is of the opinion that the disadvantages of appointing a committee to make further research in this field, outweigh the advantages.

On the other hand, the magnitude of the task assumed by the Government, and the importance of the basic principles which underlie it—more particularly the principle that the work shall be planned so that when the task is accomplished, there shall be a well designed and built National system of continuous highways—are such, that your Committee recommends that a Special Committee on Highways shall be appointed, consisting of three members, the duty of which shall be to keep in touch with the development of the Government's plan for the construction and financing of National highways, and to advise the American Society of Civil Engineers of these Governmental plans and activities, by the submission of frequent or periodic reports or critical reviews, accompanied by such data as are necessary to indicate the scope and character of the work in progress from time to time.

Special Committee to Prepare Engineering Problems and Judge Competitions for Technological Schools.

Your Committee on Special Committees, to which was referred the matter of having the American Society of Civil Engineers interest itself in promoting the work of preparing engineering problems for competition and judging the awards to be made, report as follows:

This matter was originally referred to a committee consisting of Messrs. Charles D. Marx, G. J. Fiebeger, and Edgar Marburg (now deceased). The work of the Committee was interrupted by the war, but the Chairman of the Committee on Special Committees has corresponded both with Professor Marx and Col. G. J. Fiebeger, and finds that the majority of the Committee had determined that it was not desirable that the National Engineering Society should undertake to conduct a competitive programme in relation to engineering theses; and that Professor Marburg before his death, by letter, addressed to Professor Marx, under date of April 3d, 1917, concurred in this opinion.

Inasmuch as this seems to have been the unanimous opinion of the Committee appointed, your Committee on Special Committees recommends that no action be taken at this time.

Enclosed herewith are copies of letters from Professor Marx and Col. Fiebeger.

All of which is respectfully submitted.

JOHN W. ALVORD
LEONARD METCALF
ARTHUR S. TUTTLE

Appropriations for Government Engineering Work

When the Sundry Civil Bill was signed, it gave the Geological Survey a total of $1 461 353.50 and the Bureau of Mines $1 201 897.

The important item covering the Geological Survey's topographic map work was reduced to $289 000 by the House, increased to $425 000 in the Senate and approved for $325 000 by the House confreres. It is understood, however, that the Survey is to receive an additional $100 000 from the Army's topographic appropriation.

Engineering Council interested itself in having this appropriation increased because of the possibility of complete topographic maps for the Engineering Profession. It was estimated that $500 000 would enable the Survey to complete the topographic map programme in twelve and a half years. It is now hoped to get the remaining appropriation necessary through as an urgent deficiency appropriation.

Honors for George Ellery Hale

George Ellery Hale, Director of the Mount Wilson Observatory and Foreign Secretary of the National Academy of Sciences, who has been for the last ten years a Correspondent of the Academie des Sciences, Institut de France, has received the unusual honor of election as Associe Etranger, taking the place of Adolph von Baeyer, declared vacant by the Academy. The Foreign Associates are limited to twelve, and the high distinction has been held by only two Americans—Simon Newcomb and Alexander Agassiz.

The National Research Council, upon the presentation and acceptance of Dr. Hale's resignation as its Chairman, and the election of James R. Angell as his successor, created and bestowed in perpetuity upon Dr. Hale the title of Honorary Chairman, in recognition of his services to the National Research Council and to Science and Research by indefatigable efforts that have contributed so largely to the organization of science for the assistance of the Government during the war, and the augmentation of the resources of the United States through the newly intensive cultivation of research in the reconstruction and peace periods that follow.

Col. Parsons' Farewell Address to the Eleventh Engineers

At the regimental dinner of the Eleventh Engineers, A. E. F., at the Hotel Pennsylvania, New York City, on April 30th, 1919, Col. William Barclay Parsons, Engrs., U. S. A., M. Am. Soc. C. E., said farewell to the regiment he had commanded in France in the following words:

"My men. I do not say officers and men, but, simply, my men. This is probably the only opportunity that I shall have to say a word to you all collectively.

"In a few hours the process of disintegration will begin, and in a few days this regiment will exist in history only and the close comradeship that has held us for nearly two years will be at an end.

"You and I have been together during that time. We have marched together by day and by night, we have worked and fought together in sunshine and in storm, in heat and in cold. We have been together and have seen our comrades fall, not to rise again, and we have stood side by side, with heads uncovered, as we laid them to rest in the far-away soil of France. Such a comradeship cannot be broken without a pulling of the heartstrings. As you go on your several ways you will take with you my ever-abiding affection, and I hope that you are leaving me yours.

"There are a few things that I ask you never to forget: First and above all, the record of our regiment. That record, without a stain, without a spot, is yours. You made it, it is now yours to keep. In life let it be an inspiration to you, and when moments of temptation come, as they will come to all of us, let us remember that we belonged to the Eleventh, with its record second to none, and that it is the part of each one of us to live up to that record. You were willing to die for it; are you now willing to live for it?

"It is right that men should make every effort, as men in Paris are now doing, to prevent war, but don't fool yourselves that there will be no more wars. Just so long as men are men, there will be wars and you will be called upon again. Unless the next war comes very soon, I fear that the operation of time will cut me out and it will be a younger and better man who will lead you on. For him, the best that I can ask is that you will give him the same loyal faithful support that you have given me.

"But while waiting for the next war of arms, remember there is always going on the war of good citizenship. In the war just ending you have done your duty; in the days to follow there is still a duty to perform. In your hands you have held the rifle and the pick, the weapons of the engineer; now you hold in your hands the ballot, the weapon of a good citizen. Use the latter as you have used the former, in the service of your country; and insist, as members of the Eleventh Engineers, on the highest ideals of law, order, decency, liberty and fair dealings to all men.

"I cannot at this moment shake the hand of each of you, but, before we separate in the next few days, I hope that every one of you will come to me and let me give you a parting clasp. May God bless you,

men, and keep you and give you, each and every one, all health, strength, happiness, and success. May you triumph in the battles of life, and having gained that victory enjoy 'the peace that passeth all understanding'."

Benjamin G. Lamme Awarded the Edison Medal

Benjamin G. Lamme, Chief Engineer of the Westinghouse Electric and Manufacturing Company, on May 16th, 1919, was awarded the Edison Medal by the American Institute of Electrical Engineers for "invention and development of electrical machinery." The Edison Medal was founded by friends and associates of Thomas A. Edison, and is awarded annually for achievement in electrical science, electrical engineering, or the electric arts. Elihu Thomson, George Westinghouse, Alexander Graham Bell, Frank J. Sprague, and Nikola Tesla are among those who have received the medal.

Westinghouse Company Establishes Memorial Scholarships

The Westinghouse Electric and Manufacturing Company has decided to establish a number of technical scholarships as an appropriate war memorial to its 8 000 employees who entered the service of the United States in the Great War. Under certain conditions a scholarship will entitle the successful candidate to pursue a four years' course in any technical school or college he may select. He may also choose the branch of engineering he wishes to follow. Scholarships, carrying an annual payment of $500, will be granted for one year only, but will be continued for the full four years. The candidates for scholarships must be sons of employees of the company or its subsidiaries, who have been in good standing for a period of five years.

Proposed Legislation to Strengthen the Patent Office

The Patents Committee of Engineering Council has conferred with a similar committee from National Research Council and with the staff of the Patent Office on developing improvements in the method of dealing with patents in the United States. As a result of the report, approved by National Research Council and also by Engineering Council as the report of its Patent Committee, remedial legislation has taken form.

Three bills have been introduced, known as H. R. 5011, a bill to make the Patent Office independent of the Department of the Interior, or any other Department, and to simplify the recovery of damages or profits for infringements of patents; H. R. 5012, a bill to establish a single Court of Patent Appeals; and H. R. 7010, a bill to increase the force and salaries in the Patent Office.

Chairman Charles A. Terry of the Patents Committee has requested that representatives of Engineering Council write to their Congressmen urging the passage of these bills, and so far as convenient, request their friends to do likewise.

American Firm to Rebuild Nancy, France

A contract, which at tentative figures involves $250 000 000, and which may exceed $500 000 000, has been signed by the Vulcan Steel Products Company, of New York City, for rebuilding the war-destroyed area in the Nancy district of France. The contract calls for replacing public buildings, factories, dwellings, roads, bridges, churches, in fact, practically everything that was razed by the Huns.

This is the first contract of which there is authoritative information for war reconstruction work. There have been reports that the rebuilding of parts of France and Belgium would be undertaken by American companies, and predictions that much American steel and building material would go to France, but the disposition in industrial circles has been to believe that the reconstruction would be done by the afflicted countries.

Associated with the Vulcan Company in the Nancy enterprise are two large contracting concerns, the McClintic-Marshall Construction Company and MacArthur Brothers Company. Negotiations have been in progress ever since the signing of the armistice between Rodney D. Chipp, Secretary of the Vulcan Company, and the Committee of Nancy. The $250 000 000 figure appears in the contract, but it is not a definite amount, and it is estimated that before the work is completed half a billion dollars will have been spent.

The contract was signed some time ago, but actual work has awaited the Peace Treaty. Now it is hoped to begin within a short time. The question of exchange and the French indemnity from Germany enter into the case. At present, exchange is heavily against France, but it is expected by the contractors that before any large purchase of material is made here the premium on the dollar will be much lower. The indemnity is to be used in part for the reconstruction of devastated areas, but the work will not await full payment. According to an officer of one of the contracting companies, the French Government will issue securities against the indemnity.

In many respects the plans are still incomplete because of the vastness of the undertaking. No estimates are available as to the quantity of particular materials that will be needed, but there will be much steel and concrete construction, that being the type of factory discussed with the Committee of Nancy. The new buildings will probably conform to the French idea of stone buildings.

Whether the material to be used shall come from this country or not will depend entirely on prices, as the contractors will buy where they can get material the cheapest. Many building materials are lower here than abroad, especially structural steel.

The McClintic-Marshall Company and MacArthur Brothers Company are among the largest contracting concerns in the country. The

first named concern has placed many of its former contracts for structural material with the American Bridge Company, which is a subsidiary of the United States Steel Corporation.

One of the largest stockholders, who is also a Director, in the Vulcan Steel Products Company is T. Coleman du Pont. The company, it is reported, is bidding for contracts for rebuilding other devastated areas.

Finding Concealed Water Pipes

An electrical method of determining the location of pipes concealed within walls, has, according to the *South African Journal of Industries*, recently been patented. The apparatus is made up of two sets of coils placed on the ends of a magnet bar. One set of coils receives alternating or vibratory current, and the other is connected to a telephone. The balance is first established so that no sound is heard in the telephone. When the device comes near the metal piping this disturbs the balance, and a sound is heard, thus indicating the locality of the pipes. The value of this invention exists in the saving effected in disturbing as little of the wall as possible when repairs to pipes are necessary.

Federal Electric Railways Commission

Appointment by President Wilson of the Federal Electric Railways Commission to find a solution of the street railway problem throughout the country, was announced on June 5th, 1919, by Secretary Redfield. Composing the commission are Edwin F. Sweet, Assistant Secretary of Commerce; Royal Meeker, Commissioner of Labor Statistics, Department of Labor; Louis B. Wehle, General Counsel, Finance Corporation; Charles E. Elmquist, President, National Association of Street Railway and Utilities Commissioners; Charles W. Beall, of the Investment Bankers' Association; Philip H. Gadsden, American Electric Railway Association, and William D. Mahon, Amalgamated Association of Street and Electric Railway Employes. The members of the Commission serve without pay.

Engineering Societies Employment Bureau

The service performed by the Engineering Societies Employment Bureau, 33 West 39th Street, New York City, which is operated under the direction of the Secretaries of the four Founder Societies, is shown by these figures: From December 1st, 1918, to June 30th, 1919, 3 280 applicants registered their names and qualifications for positions. Of these the records show that 629 were placed. It is probable that more than this number secured positions through the Bureau, but have failed to notify it. The number of positions listed during the above period was 1 042.

Roads and Fruit Trees

Comforting our fear that "the example of Europe" with regard to the shaded road may be "too remote for emulation" by American communities, the Countess von Krackow urges the use of fruit trees in the Continental manner. The picture she paints is persuasive as it is beautiful, observes an editorial writer in the *New York Times*.

The wayside soil, instead of growing a tangle of brush and weeds, is examined by experts and set out with trees bearing pears and apples, cherries and plums. In the Spring there are bowers of blossoms, white and pink; in Autumn the ripening fruit dapples the landscape with color. And all Summer long there is the comfort and the loveliness of leafy verdure. If any wayfarer is tempted to pluck a spray of vernal bloom, the guardian of law is there. When the first fruit ripens, children gather and sell it to the passing motorist. As the crops mature, the countryside turns out, including the poorhouse, and gathers it for the market. Sometimes the yield is sold to jobbers, and these send out agents to guard it and crews to gather it, who all live in rustic shelters among the trees. In addition to paying largely for the upkeep of the road, the arrangement provides labor and considerable chance earnings for the people of the countryside. It is a truly Arcadian poem of rustic happiness, a more than Arcadian picture of thrift.

Deeply as we are persuaded, however, a doubt persists as to the possibilities of local emulation. On the densely populated Continent, land has a value which it does not possess with us, who see limitless tracts still waiting to be claimed for agriculture. When our wayside trees flower and bear fruit they present a graphic measure of the honesty of the traveling public, for perhaps it is only a measure of our National respect for law—it is the reach of the arm to pluck flowers, or of the club to bring down fruit. The picture of wayside harvesters may bring tears to eyes long dry; but they would be idle tears, the tears of a longing that seems hopeless. Three dollars a day is the current price of our own thrice happy villagers, and at that the employer has to entreat them, as if on bended knee, in the name of his common humanity. All about there are wonderful old orchards, falling a prey to codling moth and cedar rust, to fire-blight and San José scale; and few but the farmers who plant and reap in Wall Street can afford the labor to reclaim them. If the cause of the shaded road depends upon the wayside orchard, its future seems dubious indeed.

National Research Fellowships

The National Research Council announces further appointments to National Research Fellowships in Physics and Chemistry. Previously six appointments were announced, three in Chemistry and three in Physics. The object of the National Research Council in maintain-

ing a system of research fellowships is to promote fundamental research in Physics and Chemistry primarily in educational institutions in the United States. Fellowships are awarded to persons who have demonstrated a high order of ability in research, for the purpose of enabling them to conduct investigations at educational institutions which make adequate provisions for research in physics and chemistry. The new appointments are as follows:

In Chemistry.—Warren C. Vosburgh, of New York City, B. S., Union College, 1914; A. M., Union College, 1916; Ph. D., Columbia University, 1919; Research Assistant to the Professor of Chemistry at Columbia University for the past six months.

George Scatchard, of New York City, A. B., Amherst College, 1913; Ph. D., Columbia University, 1917; Formerly Research Assistant to the Professor of Chemistry at Columbia University and Instructor in Organic Chemistry; First Lieutenant, Sanitary Corps, U. S. A.

In Physics.—Ernest F. Barker, of London, Ont., Canada, B. S., University of Rochester, 1908; M. A., University of Michigan, 1913; Ph. D., University of Michigan, 1915; Professor of Physics, Western University, London, Ont., Canada, since 1915.

Albert Edward Caswell, of Eugene, Ore.; A. B., Leland Stanford University, 1908; Ph. D., Leland Stanford University, 1911; Professor of Physics, University of Oregon, since 1917.

The members and acting members of the Research Fellowship Board are as follows: Wilder D. Bancroft, Henry A. Bumstead, Simon Flexner, George E. Hale, Elmer P. Kohler, A. O. Leuschner, Robert A. Millikan, Arthur A. Noyes, and E. W. Washburn.

Edison Advocates "The Square Deal"

Thomas A. Edison, in a message to the Annual Convention of Edison Dealers, held in New York City, in June, 1919, said:

"A new order of things is emerging from the events of the last five years. Whatever may intervene, the ultimate result is going to approach more closely a square deal—for labor, for capital, for the merchant, for the farmer, for every one. The employer who is not square with his employees, or the employee who is not square with his employer, is going to be out of step with the times.

"Demagogues may muster a following of illogical radicals who advocate injustice as a means of gaining justice, and stiff-necked reactionaries may selfishly oppose the progress which destiny has decreed as humanity's reward for the sacrifices that have beeen made, but in the end there will prevail a just and honest basis for the relations between capital and labor.

"This new relationship cannot be legislated into existence. It will spring from the conscience and patriotism of the people. The time is coming when the unjust employer and the disloyal employee will share equal odium in the esteem of society at large.

"The square deal is fatal to radicalism. There can be no social revolution in the United States or Canada for the very simple reason that our Government and the Canadian Government are founded on the idea of giving everybody a fair show. There will be few disturbances of consequence if a majority of us adopt the square deal as our business creed and our social creed. One lone man who believes in the square deal and has the courage of his convictions might very possibly convert a whole community. Accordingly, the good citizen to-day, in addition to conducting his individual business in harmony with the Golden Rule, has the duty of raising his voice and using his influence in behalf of justice for all—justice as much for the railroad corporation as for its employees, and for the common laborer as well as for the highly skilled artisan."

The Hudson Tunnel

President Wilson signed a bill on July 12th, 1919, which gives the assent of the Government to a compact between the States of New York and New Jersey for building a tunnel under the Hudson River between New Jersey and New York.

The organization of the New York State Bridge and Tunnel Commission and the New Jersey Interstate Bridge and Tunnel Commission was completed on July 1st, at a meeting in the office of the Joint Commission at 115 Broadway, New York City. The previous appointment of the following was made effective:

Clifford M. Holland, chief engineer, at a salary of $10 000 a year; Jesse B. Snow, principal assistant engineer, $5 400; Milton H. Freeman, resident engineer, $4 200; Ole Singstad, designing engineer, $4 200; Ronald M. Beck, assistant engineer, $3 000; Miss Rheata M. Latti, stenographer, $1 200, and Howard H. Stiegerwald, clerk, $1 200. Messrs. Holland, Snow, Freeman, and Singstad are members of the Society.

A board of consulting engineers has been appointed, consisting of J. Vipond Davies, Col. Henry W. Hodge, Col. William J. Wilgus, Maj. John A. Bensel, and Professor William H. Burr, all of whom are members of the Society. Each is to receive a salary of $10 000 a year. Edward A. Byrne, M. Am. Soc. C. E., Chief Engineer of the Department of Plant and Structures, also named as a consulting engineer, will receive no compensation, because of his connection with the City Government.

The duties of the consulting engineers will consist of advising the chief engineer of the Commission, to follow the progress of the work, and to report formally to the Commission every quarter. Regular meetings are to be held by the board every fortnight until the type of tunnel is decided upon, and thereafter at stated intervals. The City of New York has provided office room for the engineers in the Hall of Records.

Labor and Scientific Research

The American Federation of Labor adopted the following resolution at its Atlantic City convention:

"*Whereas,* scientific research and the technical application of results of research form a fundamental basis upon which the development of our industries, manufacturing, agriculture, mining, and others must rest; and

"*Whereas,* the productivity of industry is greatly increased by the technical application of the results of scientific research in physics, chemistry, biology, and geology, in engineering and agriculture, and in the related sciences; and the health and well-being not only of the workers, but of the whole population as well, are dependent upon advances in medicine and sanitation; so that the value of scientific advancement to the welfare of the nation is many times greater than the cost of the necessary research; and

"*Whereas,* the increased productivity of industry resulting from scientific research is a most potent factor in the ever-increasing struggle of the workers to raise their standards of living, and the importance of this factor must steadily increase since there is a limit beyond which the average standard of living of the whole population cannot progress by the usual methods of re-adjustment, which limit can only be raised by research and the utilization of the results of research in industry; and

"*Whereas,* there are numerous important and pressing problems of administration and regulation now faced by Federal, State, and local governments, the wise solution of which depends upon scientific and technical research; and

"*Whereas,* the war has brought home to all the nations engaged in it the overwhelming importance of science and technology to national welfare, whether in war or in peace, and not only is private initiative attempting to organize far-reaching research in these fields on a national scale, but in several countries governmental participation and support of such undertakings are already active; therefore be it

"*Resolved,* by the American Federation of Labor in convention assembled, that a broad programme of scientific and technical research is of major importance to the national welfare and should be fostered in every way by the Federal Government, and that the activities of the Government itself . such research should be adequately and generously supported, in order that the work may be greatly strengthened and extended; and the Secretary of the Federation is instructed to transmit copies of this resolution to the President of the United States, to the President *pro tempore* of the Senate, and to the Speaker of the House of Representatives."

Army Equipment for Highway Work

In addition to the 20 000 army motor trucks that were recently turned over to the Bureau of Public Roads by the War Department, arrangements are now being completed for a large quantity of additional engineering equipment to be distributed by the Bureau of

Public Roads. This equipment is to be furnished to the States without charge, in accordance with recent legislation empowering the Secretary of War to provide military equipment not needed for military purposes but valuable in highway construction work.

The additional equipment will be returned from France as soon as possible. It includes about 1 500 caterpillar tractors; about 400 road rollers, steam and gas driven; and a large number of concrete mixers, road graders, elevating graders, rock crushers, industrial locomotives, industrial railway track, dump cars, steam shovels, hoisting engines, electric motors, and quantities of smaller equipment. In urging the immediate return of this equipment, the Secretary of Agriculture pointed out the fact that the road programme was the biggest scheme in the stage of development for the improvement of the country, for the use of materials that will help to stabilize business along a number of lines, and for the employment of labor, and that because of the rapid expansion of this work, necessary equipment was not otherwise obtainable.

Resolutions on the Death of Homer P. Ritter, M. Am. Soc. C. E.

At a meeting of the Mississippi River Commission on April 23d, 1919, the following resolution on the death of Homer Peter Ritter,* M. Am. Soc. C. E., was presented by J. A. Ockerson, Past-President, Am. Soc. C. E., and carried:

"An All Wise Providence has suddenly called from our midst our friend and associate Homer P. Ritter, and we desire to spread upon the records of the Mississippi River Commission this statement of the deep sorrow which has fallen upon us without warning and expressions of our sympathy for his family with whom we mourn his loss.

"He entered the work of the Commission in 1879 and rendered valuable aid in the physical investigations of the Mississippi River. After serving six years in that capacity he was called to the service of the Coast and Geodetic Survey, where he was still a prominent member of its corps of experts when he came to his untimely end.

"He was appointed a member of the Mississippi River Commission in 1904, and his conscientious devotion to duty was such that although ill he insisted on accompanying the Commission on its inspection trip leaving St. Louis on April 15th, 1919, but on reaching Memphis, April 17th, illness compelled his return to his home in Washington, and he bade us a sad farewell.

"He will linger with us in fond remembrance for his kindly, genial friendship and his good qualities as a valuable Member of the Commission.

"As a matter of respect to his memory, be it resolved that the flag on the steamer *Mississippi* be carried at half mast during the present session of the Commission."

* A memoir of Mr. Ritter was published in May, 1919, *Proceedings*, p. 387.

Business Training for Engineers

A conference, under the auspices of the Bureau of Education, to discuss business training for engineers, was held at Washington, D. C., on June 23d and 24th, 1919. A large number of educational institutions and technical societies were represented by delegates. Francis R. Weller, M. Am. Soc. C. E., represented the American Society of Civil Engineers.

The discussions were participated in by a large number of the delegates and indicated that many colleges are alive to the necessity for revising their engineering courses by the introduction of more business and economic topics in such courses.

The following was adopted unanimously:

"*Resolved,* that it is the sense of the meeting that:

"1. Industrial and commercial development has created a demand for men with technical engineering training and business ability. Manufacturing industries are seeking engineers to qualify to serve in capacities requiring sound business training. Banks and brokers also need men with business training and the engineering point of view. This need is rapidly increasing and bids fair to demand a large number of technically trained men for both domestic and foreign commerce.

"2. In order to meet this demand the economic phases of engineering subjects should be emphasized wherever possible in engineering instruction. This may be done by emphasizing the problems of values and costs in the regular technical work and by introducing or extending courses in general economics, cost accounting, business organization, and business law into the engineering curricula. These courses should be designed particularly to meet the needs of the engineering student.

"3. The engineering phases of economic subjects should be emphasized wherever possible in commercial instruction. Students in commercial courses should also be given opportunity to take special courses in the basic principles and practices of engineering so that they may understand in general terms the operation of power plants and transportation systems from the engineering point of view.

"4. It is also urged upon all institutions with departments in engineering and economics or commerce that they consider some plan of co-ordination to develop a course in preparation for those careers wherein practical training in modern languages, in the essentials of engineering and business theory and practice have been found to be both helpful and necessary."

Recent Activities of Engineering Council

Engineering Council has recommended to President Wilson the appointment of an Engineer as a Member of the International Joint Commission which has authority over the boundary line between the United States and Canada.

In view of the fact that there soon may be a vacancy in the United States Interstate Commerce Commission, Engineering Council has

under consideration a letter to President Wilson recommending the appointment of an Engineer to fill this vacancy when it occurs.

Last Spring, Engineering Council took part in the organization of a National Board for Jurisdictional Awards in the Building Industry. Rudolph P. Miller, M. Am. Soc. C. E., has accepted an appointment as Engineering Council's representative on this Board which will pass upon labor and other questions of vital importance to the building industry.

The Committee on Classification and Compensation of Engineers appointed by Engineering Council is continuing its activities in three important directions—Railways, the National Government, and State and Municipal Governments. Hearings recently have been held before the Director General of Railroads.

Engineering Foundation and the Division of Engineering of National Research Council are co-operating with the University of Illinois on research concerning the phenomena of the fatigue of metals. This work will probably extend over two or three years. Engineering Foundation has offered to contribute $15 000 per year for two years; the University of Illinois will contribute the services of Prof. H. F. Moore, and the use of space, laboratories, etc.; manufacturers have agreed to furnish materials for tests; the Division of Engineering of National Research Council will supply the organization plans and advice as to the lines to be followed in this important research work.

Brief Notes

Worcester R. Warner, President of the Warner and Swasey Company, Cleveland, Ohio, and Charles F. Brush, Electrical Engineer and Inventor, of Cleveland, were elected Honorary Members of the Cleveland Engineering Society on June 10th, 1919.

Carleton E. Davis, M. Am. Soc. C. E., Chief of the Bureau of Water, Philadelphia, Pa., is the new President of the American Water Works Association.

W. J. Powell, M. Am. Soc. C. E., has been honorably discharged as Major, Transportation Corps, A. E. F., and has been appointed County Engineer of Dallas County, Texas, which is just starting a $6 500 000 road project.

According to "Statistical Summary of the War with Germany", a publication prepared by Col. Leonard P. Ayres, U. S. A., of the General Staff, and authorized by the War Department, the war cost the United States $21 850 000 000, or approximately $1 000 000 per hour. The number of men sent overseas was 2 086 000 and of these 1 390 000 saw battle service. The United States armies participated in 13 major

operations. In the Meuse-Argonne Battle, 1 200 000 American soldiers were engaged.

Secretary Glass, of the Treasury Department, has made an estimate that the war cost the United States $30 177 000 000 up to June 30th, 1919, in submitting to the Congressional Appropriation Committees the preliminary statements of the Treasury on the condition of the nation's finances.

In an address before the Union League Club of Philadelphia, Pa., on June 25th, 1919, W. W. Atterbury, M. Am. Soc. C. E., late Brigadier General, U. S. A., and former Director General of Transportation with the American Expeditionary Forces, made a stirring appeal for the immediate establishment of a strong army. In the course of his address, Gen. Atterbury criticized America's lack of preparedness at the time of its entry into the War and, in order to protect the future interests of the United States, suggested the establishment of a National Defense Board.

The resignation of Col. Samuel T. Ansell, former Acting Judge Advocate General, U. S. A., was accepted on July 21st, 1919, by Secretary Baker. Col. Ansell has announced that he will continue his fight for a radical revision of the Army court-martial system.

O. Praeger, Second Assistant Postmaster General, announces that the air mail service will be extended from Chicago to Omaha and St. Louis, next fall, and that experiments are being conducted with a view to making it possible for the mail planes to deliver and receive small bags while in flight.

At the closing session of its Annual Convention, on June 23d, 1919, the American Federation of Labor pledged itself to obtain a general 44-hour week for workers of all crafts throughout the United States, and for employees in Government service.

From the records of the Alcock-Brown Atlantic flight, aeronautic experts state that an airplane capable of carrying 100 000 lb., can be constructed, and that non-stop flights can be made from Atlantic City to England, on the consumption of not more than 1 gal. of gasoline per mile.

A direct waterway connection between Chicago and Liverpool and Hamburg, by way of the Great Lakes and the St. Lawrence River, was inaugurated by the development of operations of the United States Shipping Board, when the all-steel steamship, *Lake Granby*, built in South Chicago, cleared that port on her maiden voyage for Liverpool.

The *Journal of Commerce* states that the general economic position of Denmark has improved so much that the debt of 1 000 000 000 kroner,

owing to foreign countries in 1914, has been transformed into a credit balance of 1 000 000 000.

The State of Arizona and its fourteen counties have started on a road-improvement programme which is expected to consume at least $10 000 000, assisted by National and Forest Service appropriations.

According to figures compiled by the State Highway Department, Texas will spend, in 1919, a total of $76 216 000 on improved highways.

At the Convention of the Western Efficiency Society, in Chicago, Ill., it was stated that 55% of the factories replying to a questionnaire to determine the success of employee representation in factory management, reported that the plan had stimulated production.

Arrangements are being made between the Chinese Government and Japanese bankers for the construction of 200 miles of railroad in Manchuria.

At the request of Mr. Henry Ford, Commissioner of Internal Revenue Roper has instructed the Detroit Branch of the Internal Revenue Bureau to supply Mr. Ford with expert assistance to determine the amount of his share of profits on war contracts. He desires to return such profits to the Government.

It was announced on June 27th, 1919, that the Post Office Department had cleared $17 000 000 for the fiscal year 1918.

A dispatch from Paris states that a bill providing for the nationalization of all the railroads in France was introduced in the Chamber of Deputies on June 26th, 1919, by Albert Thomas, the Socialist leader and former Minister of Munitions.

Oregon has voted a $2 500 000 bond issue contingent on a Federal appropriation of an equal sum, to build the Roosevelt Highway, a military coast road running from Astoria to the California line.

Statistics compiled by the Railroad Administration show that a steady reduction in the number of women employed by railroads is taking place, as the result of the demobilization and return of men to their old jobs. From a high mark of 101 785 women employees, on October 1st, 1918, the number had decreased on April 1st, 1919, to 85 393. The first women to be let go were those engaged in heavy work in the round-houses and shops. In clerical occupations, where 72% of women were used, a small reduction has taken place.

It was announced that, on June 30th, 1919, the War Trade Board became a Division of the State Department, and that the functions and records of the Board were transferred to that Department.

President Wilson, on July 10th, 1919, accepted the resignation of E. N. Hurley, as Chairman of Shipping Board, effective August 1st. It is understood that Mr. Hurley will be succeeded by John Barton Payne, General Counsel of the Railroad Administration.

The proposal to issue $40 000 000 in bonds for the building of highways has been favorably passed on by a vote of the people of California.

The Shipping Board states that schools of naval architecture and ship construction may soon become important branches of the educational institutions of the United States if this nation continues its headway in maritime strength. Fourteen universities and technical colleges have signified their interest in this line of instruction, and some of them have already established courses in Naval Architecture, Marine Engineering, and Ship Construction, while others are planning similar action.

Governor Smith, of New York State, has approved the bill proposing the elimination of adult illiteracy in the State. The new law appropriates $100 000 for the Americanization plan outlined by the State Board of Regents. There are about 600 000 persons in the State who are unable to speak English, and about 350 000 who are unable to read or write any language.

A dispatch from Paris states that, on July 14th, 1919, Minister of Finance Klotz introduced, in the Chamber of Deputies, a bill approving an agreement with a company called "Credit National", organized to facilitate the repair of war damages.

According to statistics made public on July 16th, 1919, by Director General Hines, the railroads of the United States hauled 4 276 949 troops on special and regular trains for an average of 660 miles each in the first six months of 1919.

It is announced that Louisiana will spend $10 000 000 on highways in 1919-20. The Federal Government's allotment to the State so far is $3 741 000. Contracts have also been let by the State of Ohio for highway improvements to cost $3 500 000.

The American Electric Railway Association has issued an endorsement of President Wilson's action in creating a Federal Commission to investigate street railway problems.

A Paris dispatch states that contracts for reconstruction work, aggregating 200 000 000 francs, covering the rebuilding of destroyed areas of Rheims, Nancy, and Soissons, have been awarded to American firms.

The Council of National Defense has compiled a digest of "Foreign Readjustment and Reconstruction," one of "State Readjustment and Reconstruction," and "Readjustment and Reconstruction Bills and Resolutions Introduced in the 65th Congress." By special arrangement with the Council of National Defense, any part of this information is made available to all engineers through Engineering Council's National Service Committee. Complete and recent information is also available on:

Road construction work: National appropriation bills, State appropriations, war material available, comparative United States and foreign programmes, and operations of the committee to carry the work into effect.

N-C flying boats, including their design, dimensions, the purpose for which they are built, their capacity, and performance.

Description of the vocational engineering and apprenticeship courses provided by the Government, and recommendations for their use in the factory.

Description of the Interior Department's educational exposition which covers its engineering work.

According to statistics provided the French Chamber of Commerce of Deputies, by M. Lebrun, Minister of Liberated Territories, there are 550 000 buildings to be rebuilt in devastated districts of France. About 300 000 buildings were totally destroyed, and 250 000 were destroyed in part.

The War Department issues figures showing that for the period from July 1st, 1918, to April 30th, 1919, the average daily expenditures of the Military Establishment were $27 400 000, or more than one-half of the average daily expenditures for all Government purposes.

The United States Shipping Board has appointed Mr. P. A. S. Franklin, of New York City, as chairman of a committee to recommend to Congress such changes in the navigation laws relating to measurement, standardization, and construction inspection, as will place American shipping on approximately the same basis as foreign shipping.

It was announced on May 31st, 1919, that States which have expended large sums in road construction and improvement are assured equitable compensation for their work under the terms of the highway measure introduced in Congress recently by Senator Townsend, incoming Chairman of the Committee on Post Offices and Post Roads.

The Trustees of Cornell University have voted increases in salaries of all members of the Faculty, ranging from 20% to 33%, and also to raise the tuition fee to $200.

L'Intransigeant says it understands that Americans have obtained a concession from China to extend the American-Chinese Railway from its present northern terminus to the Caspian Sea, and states that Americans also intend to build a line from the Caspian Sea to the Black Sea.

In a paper on the use of light railway transportation systems, by C. F. Lang, of Cleveland, Ohio, the contention was made before the Pan-American Commercial Conference that "the light railways in practically all countries in North and South America can be built and maintained with a smaller investment than a well paved highway".

V. L. Havens, M. Am. Soc. C. E., at the Pan-American Conference, called attention to the necessity of a standardized technical vocabulary for engineers, saying that it would facilitate the exchange of engineering equipment and appliances between the Americas.

A company has been established, at Lima, to construct a long-distance telephone system for commercial use in Peru.

According to Dr. A. Lambert, President of the American Medical Association, with the exception of influenza, all epidemics have been eliminated in modern warfare.

Statistics are cited by R. S. Bonsib, Chief of the Division of Safety Engineering, Working Conditions Service, in a bulletin on safety work, to the effect that 88% of the industrial accidents are due to man failure, and are not directly chargeable to machinery at all; and that of 38 000 000 working men and women in the United States, 700 000 each year lose limbs, or are laid up for an average of four weeks each, entailing a monetary loss to wage-earners aggregating $50 000 000.

A 5-day week for brain-workers on the *London Times* has been inaugurated by Lord Northcliffe. It includes editors, copy-readers, and reporters. It is stated that the system shortly is to be extended to the *Daily Mail,* and other publications.

Dr. J. M. Goldstein, Professor of Political Economy of the High Institute of Trade and Economy of the University of Moscow, in a survey of the condition of Russia, issued by the Russian Bureau of Information, New York City, calculates that for 10 years, beginning with the death of Bolshevism, expenditures of $56 450 000 000 will be needed, of which approximately one-half will be furnished by Russia. He states that the restoration of the country, however, depends largely on assistance from the Allies.

H. E. Morgan, of the Civil Service Commission, issued a pamphlet June 16th, 1919, outlining what the United States Government, the largest employer in the world, wants to do for returning soldiers, sailors, and marines. The pamphlet contains a list of numerous kinds of jobs which go to make up the civil service army of the Government.

The invention of a hydrophone which is able to pick up the faintest sound through water at a distance of from 4 to 5 miles, and to show the exact location of the vessel creating the sound, is claimed by J. A. Burgess, formerly Master of Science, Bishop Ridley College, Ontario.

At the Atlantic City Convention, the American Federation of Labor went on record as favoring the restriction of immigration from Europe for a period of three years.

The Senate, on June 21st, 1919, passed the bill of Senator Hoke Smith, providing for the vocational rehabilitation, through Federal aid, of persons injured in industry. Under the proposed law, the Federal Government and the States will co-operate in supplying the funds.

The Office of the Director of Sales announces that the War Department has for sale a surplus of iron and steel, metal scrap, and waste materials, which has accumulated at the manufacturing plants, depots, camps, posts, and arsenals, operated by the respective Bureaus in the United States.

Following a conference at the office of J. P. Morgan and Company, Mr. H. P. Davison has announced the personnel of the Bankers' Committee which is to represent New York financial interests in drafting a comprehensive plan for extending aid to European countries and furnishing markets for American producers, as follows: J. P. Morgan, Chairman, J. S. Alexander, J. S. Brown, A. Forbes, A. W. Kerch, C. H. Sabin, J. H. Schiff, J. Stillman, S. Prosser, and A. H. Wiggin.

Robert A. Cummings, M. Am. Soc. C. E., has accepted the appointment as representative of the American Society of Civil Engineers at the ceremonies in connection with the opening of the new buildings of the United States Bureau of Mines at Pittsburgh, Pa.

At the meeting of the Board of Direction held in Minneapolis, Minn., on June 16th, 1919, the Secretary was instructed to notify the Seattle Association of Members that the Society will be glad to send its *Proceedings* and Year Book to any Local Association which has a regular meeting place, or a place where such files may be consulted.

John H. Delaney, of Brooklyn, N. Y., was named by Governor Smith on May 26th, 1919, as Transit Construction Commissioner for New York City. At the time of his appointment, Mr. Delaney was Commissioner of Plants and Structures for the City of New York.

Baron Rayleigh (John William Strutt), the eminent British physicist, died on June 30th, 1919. He was awarded the Nobel Prize for physics in 1904.

K. M. Boorman, Assoc. M. Am. Soc. C. E., and Harold Perrine, Mem. Am. Soc. for Testing Materials, have formed a professional partnership under the name of Boorman and Perrine, 112 West 42d St., New York City, for the practice of engineering in France and Italy. Mr. Boorman has sailed for France.

Death of Andrew Carnegie

Andrew Carnegie, the iron-master and philanthropist whose generous gift made possible the erection of the United Engineering Societies' Building and the Engineers' Club, in New York City, died of bronchial pneumonia at his summer home at Lenox, Mass., on August 11th, 1919. At a special meeting of the officers of the United Engineering Society and the Presidents and Secretaries of the Founder Societies, held on the afternoon of August 11th, appropriate resolutions on the death of Mr. Carnegie and his benefactions to the Engineering Profession were adopted.

ANNOUNCEMENTS

The Reading Room of the Society is open from 9 A. M. to 10 P. M., every day, except Sundays, New Year's Day, Fourth of July, Labor Day, Thanksgiving Day, and Christmas Day; during July and August, it is closed at 6 P. M.

FUTURE MEETINGS

September 3d, 1919.—8.30 P. M.—This will be a regular business meeting. A paper by Ernest Wilder Clarke, M. Am. Soc. C. E., entitled "Contracts—A Comparison of 'Cost Plus' with Other Forms," will be presented for discussion.

This paper is printed in this number of *Proceedings*.

September 17th, 1919.—8.30 P. M.—The usual meeting will be held on this evening, and announcement of the speaker and subject will be made later.

October 1st, 1919.—8.30 P. M.—A regular business meeting will be held, and a paper entitled "Physiography of Water-Sheds and Channels, and Analysis of Stream Action of Southern California Rivers, with Reference to the Problems of Flood Control", by A. L. Sonderegger, M. Am. Soc. C. E., will be presented for discussion.

This paper is printed in this number of *Proceedings*.

HOW TO MAKE REMITTANCES TO THE SOCIETY

The attention of members is called to the rule* that all remittances should be made payable to the order of the American Society of Civil Engineers. Checks, drafts, money orders, etc., should never be drawn to the order of an individual in payment of a bill from the Society. Observance of the rule will expedite clerical work and prevent avoidable delay in the closure of accounts.

ROLL OF HONOR

Now that the war is over, the monthly publication in *Proceedings* of the Roll of Honor has been discontinued. It is planned to publish later for permanent record a list of all the members of the American Society of Civil Engineers whose names have appeared on this list.

ENGINEERING SOCIETIES EMPLOYMENT BUREAU

Engineering Societies Employment Bureau, established December 1st, 1918, as an activity of Engineering Council, is managed by a board made up of the Secretaries of the four Founder Societies, funds for its maintenance being provided by these Societies. The Bureau already is co-operating with engineering organizations in all parts of the country

* See Year Book, 1919, p. 20.

and with the Professional Section of the United States Employment Bureau. It is desirous of increasing such co-operation by working with local engineering associations and clubs. The work of the Bureau since its inception has been largely in the line of securing employment for men retiring from government war service. Members of the American Society of Civil Engineers who desire to register with this Bureau should apply for further information, registration forms, etc., to Walter V. Brown, Manager, Engineering Societies Employment Bureau, 16th Floor, Engineering Societies Building, 29 West 39th Street, New York City.

SEARCHES IN THE LIBRARY

As the Library of the American Society of Civil Engineers has been merged in the Engineering Societies Library, requests for searches, copies, translations, etc., should be addressed to the Director, Engineering Societies Library, 29 West 39th Street, New York City, who will gladly give information concerning the charges for the various kinds of service. A more comprehensive statement in regard to this matter will be found on page 21 of the Year Book for 1919.

PAPERS AND DISCUSSIONS

Members and others who take part in the oral discussions of the papers presented are urged to revise their remarks promptly. Written communications from those who cannot attend the meetings should be sent in at the earliest possible date after the issue of a paper in *Proceedings*.

All papers accepted by the Publication Committee are classified by the Committee with respect to their availability for discussion at meetings.

Papers which, from their general nature, appear to be of a character suitable for oral discussion will be published as heretofore in *Proceedings*, and set down for presentation to a future meeting of the Society, and, on these, oral discussion, as well as written communications, will be solicited.

All papers which do not come under this heading, that is to say, those which from their mathematical or technical nature, in the opinion of the Committee, are not adapted to oral discussion, will not be scheduled for presentation to any meeting. Such papers will be published in *Proceedings* in the same manner as those which are to be presented at meetings, but written discussions only will be requested for subsequent publication in *Proceedings* and with the paper in the volumes of *Transactions*.

The Board of Direction has adopted rules for the preparation and presentation of papers, which will be found on page 35 of the Year Book for 1919.

LOCAL ASSOCIATIONS OF MEMBERS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

San Francisco Association, Organized 1905.

E. J. Schneider, President; Nathan A. Bowers, Secretary-Treasurer, 502 Rialto Building, San Francisco, Cal.

The San Francisco Association of Members of the American Society of Civil Engineers holds regular bi-monthly meetings, with banquet, and weekly informal luncheons. The former are held at 6 P. M., at the Engineers' Club, 57 Post Street, on the third Tuesday of February, April, June, August, October, and December, the last being the Annual Meeting of the Association.

Informal luncheons are held at noon, every Wednesday, at the Engineers' Club, where special tables are reserved for members and guests of the Association.

The by-laws of the Association provide for the extension of hospitality to any member of the Society who may be temporarily in San Francisco, and any such member will be gladly welcomed as a guest.

(Abstract of Minutes of Meeting)

April 15th, 1919.—The meeting was called to order at the Engineers' Club; President Schneider in the chair; Nathan A. Bowers, Secretary; and present, also, 84 members and guests.

The guests of the Association were James W. Beebe, Capt., Engineers, U. S. A., Assoc. M. Am. Soc. C. E., in charge of the School of Instruction for Enlisted Men at the Presidio, and Maj. Allen R. Cullimore, Chief of Educational Service, U. S. A.

Announcements relative to a paper by Maj. W. A. Cattell dealing with the progress of work of the Historical Data Section of the Engineer Corps, U. S. A.; a request from J. C. Whitman, Chief Examiner, California State Civil Service Commission, for the appointment of a committee of the Association to co-operate with the Commission in its work, which request, on motion, duly seconded, was referred to the Public Relations Committee; the change of date to May, 1920, of the General Engineering Congress to be held in Batavia, Java; and communications from Engineering Council in regard to several of its activities, were made by the Secretary. In connection with the last announcement, Mr. C. E. Grunsky was appointed to represent the Association at a conference of members of engineering and architectural societies to be held in Chicago, Ill., in June, 1919, relative to the organization of a National Department of Public Works.

Speaking for the representative of the Association on the Committee on Development, relative to the plan adopted by the Pittsburgh Association, of appointing committees to consider the same subjects as those assigned to sub-committees of the Development Committee, Mr. Edwin Duryea moved the appointment of similar committees by the Association. On motion, duly seconded, on the suggestion of President Schneider, who pointed out that the Association's Committee on Public Relations could handle that phase of the problem to be considered, the appointment of three other committees was made, namely, (1) Technical Activities; (2) Internal Relations and Relations with

Local Associations; and (3) External Relations with the Engineering Profession.

President Schneider subsequently appointed the following members of the Association as members of these Committees:

(1) Messrs. Edwin Duryea, R. A. Beebee, A. J. Cleary, J. M. Howells, and A. V. Saph.

(2) Messrs. C. J. Rhodin, C. P. Bowie, Erle L. Cope, and H. C. Vensano.

(3) Messrs. C. E. Grunsky, F. G. White, A. A. Brown, S. G. Hindes, and Leroy McWethy.

Mr. C. H. Snyder reported for the Committee on Licensing of Engineers that an agreement had been made with the Southern California Association that the Joint Council of San Francisco Engineering Societies would defer action on a bill for licensing engineers for two years and that, in the meantime, an endeavor would be made to unite all engineers of the State on some licensing measure. President Schneider congratulated Mr. Snyder on his work on the Licensing Committee, and moved that he be continued as Chairman of that Committee, which motion, having been duly seconded, was carried unanimously.

(President Schneider is one of a committee of two appointed by the Joint Council of Engineering Societies of San Francisco to represent that body on a Joint Committee to include delegates from all the engineering societies of the State, in the preparation of an Engineers Licensing Bill on which all can agree, to be presented to the next session of the Legislature.)

Mr. F. H. Muhs, reported for the Entertainment Committee that the visit to the Government concrete shipyard on the Oakland Estuary, had been greatly enjoyed by 125 members and guests. Mr. Muhs announced that the next excursion would be to the Mare Island Navy Yard and the date therefor, April 24th, was subsequently agreed upon.

Maj. George L. Dillman, reporting for the Public Relations Committee, stated that the Committee had found the classification under the head of Public Relations, on pages 1118-1119, of the December, 1918, *Proceedings*, "to be remarkably complete and well arranged, with the possible exception of the last subdivision", and recommended that the Association arrange for an evening meeting for a general informal discussion of the subjects outlined.

Secretary Bowers reviewed briefly his recent visit to the engineering organizations of the Northwest and the work that was being accomplished by such organizations.

A paper by W. Lewis Clark, Division Engineer of the State Highway Commission, on "The Development of State Highway Work in California", was presented by the author.

After a brief discussion of experience of the Engineering Department and the policy of the Commission in general by members present, the following resolution, on motion, duly seconded, was adopted:

"*Whereas*, It has been proposed that the State of California authorize a $40 000 000 bond issue for the continuation of the work of the State Highway Commission, therefore be it

"Resolved, That this Association go on record as heartily endorsing the proposed bond issue, and be it further

"Resolved, That a copy of this resolution be sent to the California Highway Commission."

A rising vote of thanks was given to Mr. Clark for his paper.

Adjourned.

Colorado Association, Organized 1908.

W. C. Huntington, President; A. N. Miller, Secretary-Treasurer, 1400 West Colfax Avenue, Denver, Colo.

The meetings of the Colorado Association of Members of the American Society of Civil Engineers (Denver, Colo.) are held on the second Saturday of each month, except July and August. The hour and place of meeting are not fixed, but this information will be furnished on application to the Secretary. The meetings are usually preceded by an informal dinner. Members of the American Society of Civil Engineers will be welcomed at these meetings.

Weekly luncheons are held on Wednesday at 12.30 P. M., at Daniels and Fisher's.

Visiting members are urged to attend the meetings and luncheons.

(Abstract of Minutes of Meeting)

June 14th, 1919.—The Eleventh Annual Meeting of the Association was called to order at the Shirley Hotel; President L. R. Hinman in the chair; A. N. Miller, Secretary; and present, also, 12 members and 1 guest.

President Hinman read the Annual Address.

The Secretary read a report on matters brought before the Association during the year and also a statement showing its financial condition. On motion, duly seconded, the report was approved and ordered filed.

The Nominating Committee reported the following candidates for officers of the Association for the year 1919-20: For President, W. C. Huntington and E. C. Jansen; for Vice-President, A. E. Palen and Oliver T. Reedy; for Secretary-Treasurer, A. N. Miller.

President Hinman appointed Messrs. Thomas H. Olds and Thomas L. Wilkinson a committee to canvass the ballot for officers, and, after a report from the Committee, declared the following officers elected: President, W. C. Huntington; Vice-President, Oliver T. Reedy; and Secretary-Treasurer, A. N. Miller.

Messrs. Thomas H. Olds and Walter L. Draeger were appointed a Committee to audit the books of the Secretary-Treasurer.

Mr. Wilkinson reported on the status of the Committee on Development.

On motion, duly seconded, a vote of thanks was offered to President Hinman for his efforts in behalf of the Association.

Mr. Arthur O. Ridgway read an abstract of the Constitution of the Colorado Engineering Council, and suggested that the Constitution be printed in the 1919 Year Book.

On motion, duly seconded, the Constitution of the Colorado Engineering Council was ratified, and the Secretary was ordered to pay the dues required.

Mr. E. A. Moritz addressed the meeting on the subject "A Department of Public Works for the Federal Covernment."

Adjourned.

Atlanta Association, Organized 1912.

T. P. Branch, President; J. T. Wardlaw, Secretary-Treasurer, 1530 Healey Bldg., Atlanta, Ga.

Informal luncheons are held for members of the Association on the last Monday of each month, at 12.30 P. M. The place is not fixed, but this information will be furnished on application to the Secretary.

Baltimore Association, Organized 1914.

H. G. Perring, President; Charles J. Tilden, Secretary-Treasurer, The John Hopkins University, Baltimore, Md.

Cleveland Association, Organized 1914.

F. D. Richards, President; George H. Tinker, Secretary-Treasurer, 516 Columbia Building, Cleveland, Ohio.

(Abstract of Minutes of Meeting)

May 31st, 1919.—The meeting was called to order at 12.30 P. M., in the rooms of the Cleveland Engineering Society; President F. D. Richards in the chair; George H. Tinker, Secretary; and present, also, 17 members.

The minutes of the meeting of February 19th, 1919, were read and approved.

Mr. Willard Beahan, Director from this District, reported on the action of the Board of Direction of the Society, at its meeting of April 15th, 1919, in connection with a resolution relative to the Committee on Development submitted by the Association. On motion, duly seconded, it was voted that Mr. Beahan be commended for his action, and requested to continue his efforts for progressive action.

President Richards announced the appointment of Mr. Beahan as alternative for Mr. E. B. Thomas at the meeting of the Committee on Development on June 11th, 1919, inasmuch as Mr. Thomas had stated that he would be unable to attend the meeting.

Mr. J. W. Ellms presented a report from the Committee on Closer Relations with the Cleveland Engineering Society. After discussion, on motion, duly seconded, it was voted that the report be adopted and further action be deferred until the Cleveland Engineering Society had taken action.

The Secretary read communications from the Association of Ohio Technical Societies in relation to the Proposed Engineers' License Bill and a convention of the Ohio Technical Societies. After discussion, on motion, duly seconded, it was voted that the Legislative Committee be instructed to attend such convention when called.

The Secretary read a resolution received from the Kansas Engineering Society and also a "Schedule of Minimum Fees for Civil Engineers" prepared by the Engineers of Mahoning Valley. It was the general opinion of the meeting that the fees were too low, and, on motion, duly seconded, the President was instructed to appoint a committee of three, including himself, to investigate and report on a scale

of wages for civil engineers and to consider the operation of trade unions and their success in improving the conditions of labor.

President Richards read a classified list of members of the Association, prepared at the request of the Publication Committee of the Society, who would assist that Committee in the examination of papers offered for presentation before the Society, and additions were made to the list at the suggestions of members.

The Secretary made a statement relative to the contemplated action of the Cleveland Engineering Society in connection with its Library and proposed new quarters. After discussion of the subject, on motion, duly seconded, the Secretary was instructed to notify the Executive Board of that Society that the Association objects to the consolidation of the Society's Library with any other library or to turning over the operation of it to any other agency.

Adjourned.

Detroit Association, Organized 1916.

T. A. Leisen, President; Clarence W. Hubbell, Secretary, 2348 Penobscot Building, Detroit, Mich.

The regular meetings of the Association are held on the second Friday of December, April, and October, the last being the Annual Meeting.

District of Columbia Association, Organized 1916.

A. P. Davis, President; John C. Hoyt, Secretary-Treasurer, U. S. Geological Survey, Washington, D. C.

Duluth Association, Organized 1917.

G. A. Taylor, President; Walter G. Zimmermann, Secretary, Wolvin Building, Duluth, Minn.

The regular meetings of the Association are held at noon on the third Monday of each month (usually at the Kitchi Gammi Club), with luncheon, followed by a short business session and the reading of papers. Visiting members of the American Society of Civil Engineers can secure from the Secretary definite information relative to the meetings, at which they will be welcomed. The Annual Meeting is held on the third Monday in May.

(Abstract of Minutes of Meetings)

May 19th, 1919.—The meeting was called to order at the Kitchi Gammi Club; President W. B. Patton in the chair; Walter G. Zimmermann, Secretary; and present, also, 26 members and 2 guests.

The reading of the minutes and the regular order of business were suspended, in order to give more time for reports of Committees and plans for the Annual Convention of the Society.

Mr. W. H. Hoyt reported in detail on the Committee meeting held in St. Paul on May 10th, 1919, at which meeting the complete programme for the Annual Convention was laid out. Mr. J. R. Stack, of the Committee on Local Entertainment, stated that he, with the other members of the Committee, Messrs. Pope and Pickles, had spent two days on the Mesabi Range, going over the plans for the trip there with the officers of the Engineers Club of Northern Minnesota, and that

Mr. Maney of the Shenango Furnace Company, had assured the members of the Committee that the representatives of the Mining Companies on the Range would do all in their power to see that the visitors at the Annual Convention were properly taken care of and conducted over the Range.

President Patton announced that, at a meeting of the Board of Directors, he had appointed Messrs. John Carson and W. E. Hawley, a Special Committee on Finances to raise funds for the entertainment of the visitors. The circulation of a subscription list at the meeting resulted in a contribution of $270. Mr. Stack also reported that the Duluth Engineers Club had offered assistance in the matter of finances, and the Committee was instructed to send invitations to all members of that Club to participate in the trip over the Range.

President Patton introduced George C. Newton, Assoc. M. Am. Soc. C. E., representing the Fabricated Ship Corporation, of Milwaukee, Wis., who gave an interesting talk on the subject of "Ship Building."

The following officers were elected for the ensuing year: President, G. A. Taylor; First Vice-President, W. A. Clark; Second Vice-President, J. L. Pickles; Secretary, Walter G. Zimmermann, and Treasurer, John Carson. These officers, with the latest Past-Presidents, namely, Messrs. House and Patton, will constitute the Board of Directors for the coming year.

A rising vote of appreciation for his services as President for the past year was tendered Mr. Patton, and this was followed by a silent toast to the memory of our former members, Messrs. Clarence Coleman and E. Porter Alexander, who had died during the year.

The Auditing Committee, Messrs. Woodbury and Bryan, reported that they had audited the Treasurer's accounts and had found them in proper shape.

Adjourned.

June 16th, 1919.—The meeting was called to order at the Kitchi Gammi Club; President G. A. Taylor in the chair; Walter G. Zimmermann, Secretary; and present, also, 19 members and 1 guest.

The minutes of the previous meeting were read.

Messrs. Pickles and Pope, of the Local Committee on Arrangements for the Annual Convention, reported that practically all the arrangements for the visitors had been made.

President Taylor appointed the following Committees for the ensuing year: Entertainment: Messrs. Lyonel Ayres and J. L. Pickles; Publicity: W. E. Hawley and W. H. Woodbury; Papers and Records: H. C. Ash, J. R. Stack, and O. H. Dickerson; Auditing: George Bryan, Jr., and W. H. Woodbury; Development: W. A. Clark, C. D. Christie, E. K. Coe, and D. A. Reed; Licensing Engineers: D. A. Reed, Leland Clapper, and H. E. McCool; Library: Frank Hutchinson, H. C. Ash, and C. D. Christie.

The Secretary read letters from Messrs. E. R. Lewis and Byron G. Best.

A paper by H. E. McCool entitled, "Cinder Concrete", was read by the author. This paper is to be discussed at the next meeting of the Association.

Adjourned.

Illinois Association, Organized 1916.

H. J. Burt, President; Edgar S. Nethercut, Secretary-Treasurer, 1735 Monadnock Blk., Chicago, Ill.

The regular meetings of the Association are held on the second Monday of March, June, September, and December, the last being the Annual Meeting. The hour and place of meeting are not fixed, but this information will be furnished on application to the Secretary.

(Abstract of Minutes of Meeting)

July 15th, 1919.—The meeting was called to order at the Chicago Engineers' Club; President H. J. Burt in the chair; E. S. Nethercut, Secretary; and present, also, 37 members and guests.

The President announced the results of the Annual Meeting of the Association, in January, 1919, and explained the omission of other stated meetings.

The President stated that the object of this meeting was "to consider the June report of the Committee on Development," and introduced Mr. Onward Bates, Chairman of that Committee.

Mr. Bates explained briefly the organization of the Committee on Development and the manner of the appointment of its members, reviewed its meetings of November, 1918, and June, 1919, stated the plans for its third meeting, and announced that its final report was to be presented to the Annual Meeting of the Society in January, 1920, calling the attention of members of the Association to the problem as related to Chicago and the relation of the Association to the Western Society of Engineers.

The President announced that the report of the Committee would be taken up, section by section, for discussion by the meeting.

Section (A) "Relations with Other National Societies and Related Organizations", was discussed by E. T. Howson, Secretary of the Committee, who endorsed the recommendation that the Society should continue to pursue the objects for which it was organized as expressed in its Constitution, and the preservation of the identity of the four National Societies.

Mr. Edgar S. Nethercut, representing the Association on the Committee, explained Section (B) "Internal Relations and Local Associations", and emphasized the recommendation of the Committee with regard to the young men of the Profession and engineering students.

Section (C) "Technical Activities", was discussed by Mr. Albert Reichmann, who endorsed the recommendations of the Committee and emphasized the opportunities for committee work, especially in the matter of committees on standardization of practice.

John W. Alvord, Director from District No. 8, spoke on Section (D) "Relation to Public Affairs", emphasizing particularly the importance of the engineer taking his part in public affairs and doing active work in the Society. In regard to the Code of Ethics, Mr. Alvord suggested the appointment in each District of an engineer whose duties would consist in arbitrating differences between engineers, etc.

The subject was discussed generally by Messrs. J. H. Brillhart, William H. Popert, J. H. Prior, Murray Blanchard, A. J. Hammond, J. L. Jacobs, H. C. Phillips and Ralph Modjeski.

The President stated that the subject for discussion at the meeting of September 2d, 1919, would be "The Relation of the American Society of Civil Engineers to Other Societies, National and Local."

Adjourned.

Louisiana Association, Organized 1914.

Arsène Perrilliat, President; Eugene F. Delery, Secretary, 503 City Hall Annex, New Orleans, La.

The regular meetings of the Association are held at The Cabildo, New Orleans, La., on the first Monday of January, April, July, and October.

Nebraska Association, Organized 1917.

*_____, President; Homer V. Knouse, Secretary-Treasurer, 200 City Hall, Omaha, Nebr.

Regular meetings of the Association are held on the first Saturday of each month, except July and August, and at such places as may be appointed from time to time by the Executive Committee. The Annual Meeting is held in Lincoln, Nebr., on the second Friday in January.

Visiting members of the Society are especially urged to communicate with the Secretary when in the city.

Northwestern Association, Organized 1914.

Ralph D. Thomas, President; W. N. Jones, Secretary, City Engineer's Office, City Hall, Minneapolis, Minn.

The meetings of the Association are held bi-monthly, alternating between St. Paul and Minneapolis, on the third Friday of each month. Information as to the time and place of such meetings will be furnished on application to the Secretary.

Philadelphia Association, Organized 1913.

F. Herbert Snow, President; Henry T. Shelley, Secretary, 416 City Hall, Philadelphia, Pa.

The regular meetings of the Association are held at the Engineers' Club of Philadelphia, 1317 Spruce Street, on the first Monday in January, April, and October, the last being the Annual Meeting.

(Abstract of Minutes of Meeting)

June 2d, 1919.—A special meeting of the Association was called to order at 8 P. M., at the Engineers' Club; President F. Herbert Snow in the chair; H. T. Shelley, Secretary; and present, also, 50 members and guests.

The purpose of the meeting was the discussion of the report of the Committee on Public Affairs. This meeting was the last of a series of meetings held monthly since January, 1919, for the purpose of determining the attitude of the members toward the development of the Society, of formulating a definite policy in regard to that undertaking, and to make definite recommendations for the guidance of the local representative on the Committee on Development of the Society. All these meetings were well attended, and the discussions which were entered into very generally, resulted in many definite recommendations.

* Mr. Adna Dobson, the President of the Association, died on May 4th, 1919.

On account of lack of time, several subjects were referred back to the Committees for amplification and further report at a meeting to be held in September. It is the purpose of the Association to continue the work until the whole subject of Development has been covered thoroughly.

At the regular meeting of the Philadelphia Association of Members of the American Society of Civil Engineers held at the Engineers' Club on January 6th, 1919, it was recommended by Mr. Richard L. Humphrey that a meeting of the Association be held in the latter part of January, 1919, or early in February, for the purpose of discussing the work of the Committee on Development. It was voted, at that meeting, that the President appoint a committee to consider the address and discussions of the evening, the address of the President of the American Society of Civil Engineers, and the tentative report of the General Development Committee of the Society, with a view of organizing various committees to be appointed by the President of this Association, to consider specific subjects involved in the addresses, discussions, and report, and to recommend to the Board of Direction such committees and the scope of the work of each, as the committee may deem advisable.

In accordance with this motion, the President appointed the following committees: Committee on Technical Activities; Committee on Internal Relations; Committee on External Relations; Committee on Public Affairs.

These Committees held weekly meetings, and their reports were embodied in the report of the Committee on Development submitted at the special meeting held on February 3d, 1919. The report was taken up for discussion by Committees in the order named, beginning with the report of the Committee on Technical Activities and closing with that of the Committee on Public Affairs.

The reports included recommendations for many changes in the present method of Society procedure and for the greater usefulness of the Society to the individual member as well as to the public. The advisability of more meetings, affiliation with other organizations, co-operation in local, State, and National movements were thoroughly discussed, as were also publications, technical papers, standards, co-operative educational effort, ethics, fees, salaries, publicity, and other subjects.

In order to afford members an opportunity to express their views on the subject of the development of the Society, a printed circular was sent to all members of the American Society of Civil Engineers residing in the Fourth District, eligible for membership in the Philadelphia Association, requesting their participation in the discussions and co-operation in determining final recommendations. The Association, through its committees, has accomplished a great deal in the past year, and as an active programme is being formulated for the coming year, it is hoped that every member of the Society will give the Association the benefit of his services and take an active part in its work.

The next meeting of the Association will be held early in September.

Adjourned.

Pittsburgh Association, Organized 1917.

Robert A. Cummings, President; Nathan Schein, Secretary-Treasurer, 1510 Carson Street, Pittsburgh, Pa.

The Annual Meeting of the Association is held on the first Monday in October. The time and place of other meetings are not fixed, but this information will be furnished on application to the Secretary.

Portland, Ore., Association, Organized 1913.

E. Burslem Thomson, President; C. P. Keyser, Secretary, 318 City Hall, Portland, Ore.

The Annual Meeting of the Association is held on the second Friday in January. Other meetings are called by the President and are usually convened on Friday evenings. The place is not fixed, but this information may be obtained on application to the Secretary. All members of the American Society of Civil Engineers are cordially invited to attend the meetings.

(Abstract of Minutes of Meetings)

May 16th, 1919.—The meeting was called to order at the University Club at 8 P. M.; President Thomson in the chair; C. P. Keyser, Secretary; and present, also, 13 members.

The Secretary read his letter to Chas. Warren Hunt, Secretary of the Society, and the latter's reply, in the matter of a statement relative to the approval of the Association of the Engineers' Registration Act, in the March, 1919, *Proceedings,* page 304, to which the Association had taken exception. On motion, duly seconded, the Secretary was instructed to reply to Dr. Hunt advising that Roy A. Klein, Assoc. M. Am. Soc. C. E., who furnished the information, is not a member of the Association.

A communication was read from Mr. U. B. Hough, of the Spokane Association, and a member of the Nominating Committee of the Society, the purpose of which was to evoke interest in District No. 12 in the coming election of officers of the Society. On motion, duly seconded, the communication was ordered placed on file. At the suggestion of Mr. J. C. Stevens, who observed that the Association had heretofore neglected to use its influence in this regard, on motion, duly seconded, the following ticket was nominated: For President, Gardner S. Williams; Vice-Presidents, E. C. Carter and Robert A. Cummings; and Director from District No. 12, D. C. Henny.

A communication from Secretary Hunt asking for co-operation with the Publication Committee of the Society in the work of reviewing papers before the Society, was read. On motion, duly seconded, the matter was referred to President Thomson with power.

A letter dated April 28th, 1919, from S. N. Castle, Secretary of an Aims and Objects or Development Meeting, held in New York City, was read and ordered filed.

A letter from J. W. Cunningham, President of the Oregon Society of Engineers, asking that the Association appoint two delegates to consider the coalition of all engineering bodies, was read. On motion, duly seconded, President Thomson and Vice-President Reed were appointed as such delegates, and the Secretary was instructed to advise Mr. Cunningham to that effect.

In the absence of Chairman Hopson, Mr. Reed reported that the Committee on Questionnaire was working on forms and would make a final report at the next meeting of the Association.

On motion, duly seconded, the Secretary was instructed to write to the Governor of the State that, although the Association had opposed the Engineers' Registration Act, it was willing and ready to co-operate, now that it had become a law, in its administration, and to offer assistance in the appointment of the Board of Examiners.

The meeting was addressed informally by B. F. Cresson, Jr., M. Am. Soc. C. E., on the establishment and work of the New York-New Jersey Port and Harbor Development Commission, of which he is Consulting Engineer.

G. H. Binkley, M. Am. Soc. C. E., also addressed the meeting briefly on the attendance, programme, work, etc., of the San Francisco Association.

Adjourned.

June 4th, 1919.—The meeting was called to order at 8 P. M., at the University Club; President Thomson in the chair; C. P. Keyser, Secretary; and present, also, 17 members.

The minutes of the meeting of May 16th, 1919, were read and approved.

Bills for advertising, stationery, etc., were approved and ordered paid.

The Secretary read his letter, addressed to members in other cities in District No. 12, proposing a slate for officers of the Society, together with replies which had been received from members in Boise, Spokane, and Seattle. These replies showed that Boise and Seattle are in complete agreement, Tacoma silent, and Spokane offering a change in the nominee for President. On motion, duly seconded, the Secretary was instructed to reply to members in Spokane accepting their recommendation on the nominee for President, the slate to stand otherwise as originally offered.

The Secretary read his letter to Governor Alcott and the latter's reply, in the matter of the Association's interest in the administration of the Engineers' Registration Law. On motion, duly seconded, it was decided to recommend a slate for members of such Board, chosen from names recommended by the Local Chapter of the American Association of Engineers and the Oregon Society of Engineers, such list to consist, however, only of as many names as there are places on the Board, with the additional statement that the Association does not favor the appointment of men who hold public office.

From the list submitted by the Secretary, the following representatives were nominated and elected: Civil, W. S. Turner, and C. B. McGonigle; Mechanical, Fred M. Hesse and G. A. Covell; Mining, H. M. Parks and R. M. Betts; Hydraulic, E. G. Hopson and J. L. Stannard; and Electrical, O. B. Coldwell, with R. H. Dearborn, as alternate.

Mr. E. G. Hopson presented the report of the Committee on Questionnaire and Individual Register of Local Engineers. On motion, duly seconded, the report was adopted and the Committee thanked for its careful and thorough work.

On motion, duly seconded, a copy of this report was ordered to be sent to the Secretary of Engineering Council and a copy given to Mr. G. C. Mason to present to the Committee on Development.

On motion, duly seconded, the request of Mr. Thomson, Chairman of the Committee on Assistance to the Publication Committee, for the continuance of that Committee was granted.

Mr. Mason, the representative from District No. 12 on the Committee on Development, stated that the Committee would meet in Minneapolis, Minn., prior to the Annual Convention, outlined the present status of its work, and asked for suggestions from members of the Association. On motion, duly seconded, a vote of confidence in Mr. Mason was carried unanimously.

It was suggested that Portland ask for the next Annual Convention, and, on motion, duly seconded, President Thomson was instructed to appoint a committee of one or more members, to get in touch with Mr. Frank Branch Riley and endeavor to have his lecture on "Northwest Scenery" delivered before the Society at the Annual Convention in Minneapolis.

On motion, duly seconded, the Committee on Engineers' Registration or License was discharged.

Adjourned.

June 5th, 1919.—A special meeting of the Association was held at the office of Mr. D. C. Henny; Vice-President Hoffmark in the chair; C. P. Keyser, Secretary; and present, also, 7 members.

The meeting was called by President Thomson to reconsider the action of the meeting of June 4th, 1919, in the matter of the nomination of a candidate for President of the Society.

On motion, duly seconded, the action of the Association of June 4th, concurring with the Spokane Association, was reconsidered, and Mr. Arthur P. Davis was nominated as candidate for President of the Society. This action was unanimous on the part of those present at the meeting, and it was reported, further, that no objection had been raised to Mr. Davis by telephone conference with such members as could be reached, and who were not present at the meeting.

Adjourned.

St. Louis Association, Organized 1888 (Constitution Approved by Board, 1914).

J. A. Ockerson, President; C. W. S. Sammelman, Secretary-Treasurer, 300 City Hall, St. Louis, Mo.

The Annual Meeting of the Association, for the election of officers and for the transaction of business, is held on the fourth Monday in November. Two meetings each year, for the presentation and discussion of technical papers, are held in the Auditorium of the Engineers Club of St. Louis and are open to members of the Associated Societies. Other "get-together" meetings are held regularly for dinner or luncheon on the fourth Monday of each month except July, August, and November.

(Abstract of Minutes of Meeting)

May 26th, 1919.—The meeting was called to order at 1 P. M., at the American Hotel; President Ockerson in the chair; C. W. S. Sammelman, Secretary; and present, also, 21 members and 2 guests.

The minutes of the previous meeting were read and approved.

After discussion of the subject, it was decided, on motion, duly seconded, to give the Programme Committee full power to act in the matter of character and place of meetings.

On motion, duly seconded, it was voted that papers for publication be submitted by the Publication Committee to the Executive Committee of the Association.

Mr. Baxter L. Brown, a member of the Committee on Development, requested that members of the Association assist him by making suggestions, and also presented resolutions adopted by the District of Columbia Association, and by the Ohio, Kansas, and Rochester, N. Y., Engineering Societies.

On motion, duly seconded, the following resolutions of the District of Columbia Association, were approved, No. 1 to be construed in its broadest sense:

"1. *Resolved,* That the Association endorses the idea of a stronger central organization of the engineers of the United States.

"2. *Resolved,* That the Association endorses the idea of a National Department of Public Works, under an eminent engineer to be a member of the Cabinet.

"3. *Resolved,* That the Association endorses the idea that the Annual Meeting of the American Society be composed of delegates of Local Associations or Districts.

"4. *Resolved,* That the Association reaffirms its position of last year, to the effect that the Secretary of the American Society of Civil Engineers should not be a member of the Board of Direction."

The following resolutions adopted by the Ohio, Kansas, and Rochester, N. Y., Engineering Societies, were approved in principle:

"*Whereas,* During the recent world war, the value of the services of professional engineers has become forcefully apparent to and gratefully appreciated by the people of this nation; and

"*Whereas,* It is a well recognized fact that the compensation received by professional engineers, more especially the younger men, has always been low in comparison by trades for services of no greater comparative value; and

"*Whereas,* The need of greater compensation by professional engineers is felt keenly at this time, on account of the recent great advance in the cost of living, and on account of the National recognition of this economic condition in dealing with other professions and trades enjoying proper representation; and

"*Whereas,* The American Society of Civil Engineers, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers, and the Engineering Council formed by these bodies, seem to have recognized their obligation to professional engineers in matters pertaining to the proper recognition of the value of engineering service;

"*Be it Resolved,* To appeal to these four great National Societies and their Engineering Council, praying that they, in unity, act in the premises by:

"(1) Providing a practical plan for the registration and proper classification according to character of services of all professional engineers and their assistants.

"(2) Arranging a standard nomenclature to designate the various capacities in which engineers and their assistants serve.

"(3) Adopting, after careful study, a scale of fees and of salaries for the young men of the Profession in such form that it can be used by all local organizations of engineers through the nation in their efforts to secure a fair comparative compensation in accordance with the value of services rendered; and

"(4) Providing a standing committee to co-operate with all organizations of engineers in matters pertaining purely to compensation.

"The Ohio Engineering Society pledges its allegiance and support to the four National Societies in the measure they may develop to supply these urgent needs and essential fundamental requirements for placing the Profession of Engineering on a proper and benefiting plan of industrial equity."

Adjourned.

San Diego Association, Organized 1915.

W. C. Earle, President; R. C. Wueste, Secretary-Treasurer, Bonita, Cal.

Seattle Association, Organized 1913.

L. M. Grant, President; G. A. Collins, Secretary, 1317 L. C. Smith Bldg., Seattle, Wash.

The regular meetings of the Association, with luncheon, are held at the Engineers' Club, Arctic Building, Third Avenue and Cherry Street, at 12.15 P. M., on the last Monday of each month. Informal luncheons are also held at 12.15 P. M., every Monday at the Engineers' Club.

Special evening meetings are held from time to time for the purpose of discussing important topics, and information concerning these meetings may be had by addressing the Secretary. All members in any grade of the American Society of Civil Engineers are cordially invited to attend the meetings when in the vicinity, and, if located in this District for any length of time, their membership in the Association will be appreciated.

Southern California Association, Organized 1914.

George G. Anderson, President; Floyd G. Dessery, Secretary, 511 Central Building, Los Angeles, Cal.

The Southern California Association of Members of the American Society of Civil Engineers (Los Angeles, Cal.) holds regular monthly meetings on the second Wednesday of each month, the December meeting being the Annual Meeting.

Informal luncheons in connection with the Joint Technical Societies of Los Angeles are held at 12.15 P. M., every Thursday at the Broadway Department Store Café.

The by-laws of the Association provide for the extension of hospitality to any member of the Society who may be temporarily in Los Angeles, and any such member will be gladly welcomed as a guest at any of the meetings or luncheons.

(Abstract of Minutes of Meeetings)

May 14th, 1919.—The meeting was called to order at 6.05 P. M., at Christopher's Café; President Anderson in the chair; H. W. Dennis, Secretary, *pro tem.;* and present, also, 24 members and 22 guests.

The reading of the minutes of the previous meeting was dispensed with, as they had already been printed and distributed to the membership.

A letter from Mr. F. E. Trask, Chairman of the Committee on Reconstruction and Development, was read, and in the absence of Mr. Trask, President Anderson explained the efforts of this Committee with particular reference to the re-employment of returned soldiers.

Mr. Burdett Moody, Chairman of the Committee on Co-operation with Federal Bureaus, presented a report from that Committee and a resolution looking to the furtherance of its work with the various Federal Bureaus. Mr. F. D. Bowlus suggested that the United States Department of Agriculture, Irrigation Division, Bureau of Public Roads, be included as a possible source of further information. On motion, duly seconded, the resolution as presented by Mr. Moody was modified to include the suggestion of Mr. Bowlus, and was carried. A vote of thanks was extended to the Committee which was continued.

President Anderson reported on the Committee on Development of the Society, and announced that a meeting of this Committee was called for June 11th, 1919, at Minneapolis, Minn.

The business meeting was then adjourned, and the Association reconvened at dinner. At the conclusion of the dinner, President Anderson introduced the principal guests of the evening, the Hon. W. A. Johnstone, of the California State Water Commission, and the Hon. Jonathan S. Dodge, Chairman of the Los Angeles County Board of Supervisors, both of whom addressed the meeting briefly.

In continuance of the Symposium on the subject of "Flood Control in Southern California", President Anderson read a review, prepared by himself and Mr. W. K. Barnard, of the papers previously presented on the subject, and the discussion was continued by Messrs. W. D. Smith, Samuel Storrow, C. T. Leeds, E. R. Bowen, A. M. Strong, F. D. Bowlus, H. Hawgood, Ford A. Carpenter, H. W. Dennis, and Willis Jones.

Adjourned.

June 11th, 1919.—The meeting was called to order at Christopher's Café at 7.30 P. M.; Vice-President W. K. Barnard in the chair; F. G. Dessery, Secretary; and present, also, 20 members and 8 guests.

The minutes of the meeting of May 14th, 1919, were approved as printed in the Bulletin.

The minutes of the meeting of the Board of Directors held on May 14th, 1919, were read and approved.

F. E. Trask, Chairman of the Committee on Reconstruction and Development, presented an extensive written report showing the progress of the Committee and the efforts made in behalf of returned soldiers. On motion, duly seconded, the report was ordered filed and the Committee continued.

The Secretary announced new members of the Association as follows: Messrs. T. D. Allin, Jay B. Harris, W. W. Orcutt, and C. R. Sumner.

The Secretary read a letter and a resolution received from the Joint Technical Societies, urging Mayor-elect M. P. Snyder to appoint engineers on the personnel of the commissions in the new City Administration.

Chairman Moody and Mr. Morris, of the Committee on Co-operation with Federal Bureaus, reported progress in the work of that Committee and promised an early report.

An invitation was extended to members of the Association by Mr. Franklin Thomas to attend the meeting of the American Society for the Advancement of Science, at Pasadena, Cal.

The Secretary read a telegram from Governor Stephens regretting his inability to attend the meeting.

Vice-President Barnard, of the Programme Committee, outlined the changes in the programme necessitated by reason of the absence of members from the city.

A paper entitled "Check Dams", by Mr. F. H. Olmsted, was presented by the author, and the subject was discussed by Messrs. Warrington, La Rue, Hill, Strong, Ebert, Tait, Willis S. Jones, Sawyer, Bowlus, W. D. Smith, Morris, Barnard, and Pratt.

After a reference to the Conservancy Act, Senate Bill No. 280, which is now a law, Vice-President Barnard introduced its author, Mr. Charles E. Haas, who spoke in detail on Flood Water Acts and Legislation.

The subject of holding meetings of the Association during July and August, was brought up by Vice-President Barnard; it was moved and seconded that meetings during those months be suspended. After discussion by Messrs. Bowen, La Rue, Barnard, and Moody, it was decided to continue the meetings during the next two months.

Adjourned.

July 9th, 1919.—A called meeting of the Association was held at Christopher's Café at 7.30 P. M.; President George G. Anderson in the chair; F. G. Dessery, Secretary; and present, also, 26 members and 13 guests.

The minutes of the meeting of June 11th, 1919, were read and approved. A communication from Dr. Ford A. Carpenter, U. S. Meteorologist, relating to additional data in the daily meteorological reports, was read, and by direction of President Anderson was referred to the Committee on Co-operation with Federal Bureaus, which Committee was directed to give the matter urgent attention.

President Anderson then introduced the speakers of the evening. As a part of the Symposium on Flood Control, Mr. C. E. Tait, Senior Irrigation Engineer, Bureau of Public Roads, U. S. Department of Agriculture, read an interesting and comprehensive paper on "Spreading Flood Waters as Related to Flood Control", and Mr. Willis S.

Jones gave an interesting extemporaneous address on "Spreading Flood Waters as Related to Conservation." The subject matter of these two papers was considered of such importance, that, at the suggestion of Mr. A. L. Sonderegger, it was made the topic of discussion at the next meeting.

Mr. Hawgood, a member of the Board of Direction of the Society, gave an interesting account of the work accomplished by, and the entertainment of members at, the Annual Convention, at Minneapolis and St. Paul, Minn., and paid high tribute to the services performed by President Anderson as a member of the Committee on Development.

President Anderson reviewed, at some length, the work of the Committee on Development and its efforts at the meeting in Minneapolis, Minn., and stated that practically all the changes suggested by the Association had been embodied in its report and that its report, as outlined, is only fundamental of the final report.

Mr. Sonderegger, of the Committee on Co-operation with Federal Bureaus, made a verbal report on the information secured at Washington, D. C., on Engineering Council, and the Secretary read a communication from Mr. M. O. Leighton, Chairman of the Service Committee of Engineering Council.

President Anderson and Mr. Hawgood commented on the efforts of Engineering Council, and it was suggested that members of the Association desiring engineering information take advantage of the offer to that effect contained in Mr. Leighton's letter.

Adjourned.

Spokane Association, Organized 1914.

Harold J. Doolittle, President; Charles E. Davis, Secretary, City Engineer's Office, Spokane, Wash.

The regular meetings of the Association are held on the second Friday of each month, except July and August. The hour and place of meeting are not fixed, but this information will be furnished on application to the Secretary.

Visiting members are invited to attend the meetings.

Texas Association, Organized 1913.

R. J. Potts, President; J. H. Brillhart, Secretary, Care, Mosher Mfg. Co. Dallas, Tex.

(Abstract of Minutes of Meeetings)

April 25th, 1919.—The meeting was called to order at the St. Anthony Hotel, San Antonio, Tex., at 10 A. M.; President R. J. Potts in the chair; E. W. Robinson, Secretary *pro tem.;* and present, also, 28 members and 12 guests.

The minutes of the meetings of December 13th and 14th, 1918, held in Dallas, Tex., were read and approved.

President Potts read a paper prepared by Mr. J. H. Brillhart who was unable to be present, entitled "Suggested Change for the American Society of Civil Engineers." The paper brought out considerable discussion by those present in regard to the proposed activities of the Committee on Development of the Society.

Mr. J. M. Howe, Chairman of the Legislative Committee, reported on the work of that Committee in its efforts to secure the passage of an Engineers' License Bill through the State Legislature. It is expected that this bill will be passed and become a law at the next session of the Legislature.

Professor F. E. Giesecke presented a paper on "Improving Concrete by Rodding", which was generally discussed.

Adjourned at 12.45 P. M.

The meeting reconvened at 2.30 P. M., with President Potts in the chair; E. W. Robinson, Secretary *pro tem.*

Mr. C. S. Fowler, a member of the State Highway Commission of Texas, addressed the meeting in regard to the work to be undertaken by that Commission. Subsequently, at the request of Mr. Fowler, the following resolution, was, on motion, duly seconded, adopted:

"Resolved, That a special committee of five, be appointed to cooperate with the State Highway Department in regard to the engineering features of highway work in Texas".

President Potts subsequently announced the names of the committee as follows: Messrs. J. F. Witt, Chairman, J. M. Howe, Manton Hannah, J. C. Nagle, and Terrell Bartlett.

Mr. M. C. Irwin, formerly Assistant City Engineer of San Antonio, in charge of sewers, presented a paper entitled "The San Antonio Sewer System." In addition, Mr. Irwin gave a short description of some tests recently made at the plant of the San Antonio Sewer Pipe Works on the strength of culverts constructed of vitrified clay segmental blocks.

Maj. J. B. Hawley addressed the meeting on his work in connection with water supply and sewage disposal in France.

A paper entitled "Effect of Mineral Aggregate on the Life of Bitulithic Pavement", was presented by Mr. Roy M. Green, and illustrated by samples cut from existing pavements in various cities in Texas.

The President addressed the meeting briefly relative to membership in the Texas Association.

Adjourned.

April 26th, 1919.—The meeting reconvened at 10 A. M.; President Potts in the chair; and E. W. Robinson, Secretary *pro tem.*

Twelve men were elected to membership in the Association.

The President read communications from Mr. Brillhart in regard to the work of the Committee on Development of the Society; from George F. Horton, President of the Texas Association of General Contractors, relative to the practice of engineers advertising for the receiving of bids when there is little or no chance of a contract being awarded; from Charles Warren Hunt, Secretary of the Society, in regard to the appointment of a committee to assist the Publication Committee of the Society; and from Mr. F. C. Packard expressing regret at being unable to attend the meeting.

After a short discussion of Secretary Hunt's communication, the President was authorized, on motion, duly seconded, to forward to Mr. Hunt a list of names of members whom he considered to be qualified to co-operate with the Publication Committee of the Society.

After discussion of Mr. Horton's letter, the President was, on motion, duly seconded, authorized to appoint a Resolution Committee. President Potts subsequently appointed the following as such committee: Messrs. J. B. Hawley, Chairman, A. C. Love, and C. N. Black.

The following resolution was presented by the Resolution Committee:

"*Resolved,* that it is the sense of this Association:

"(*a*) That members should decline to assent to advertisement for proposals or other formal solicitation of bids on work unless sufficient funds for construction shall have been provided.

"(*b*) That certified checks accompanying bids should be fixed at reasonable size only.

"(*c*) That all certified checks accompanying bids, excepting that of the successful bidder, be returned upon award of the contract."

Mr. R. G. Upton, of the State Bureau of Sanitary Engineering, addressed the meeting on the work of that Bureau and requested the endorsement of the Association of its work. On motion, duly seconded, the President was authorized to appoint a committee to co-operate with and endorse the general scope of the work of the State Bureau of Sanitary Engineering. The President later announced the appointment of the following committee: Messrs. J. B. Hawley, Chairman, A. J. Wise, and E. W. Robinson.

Capt. J. D. Fauntleroy, District Engineer of the U. S. Office of Public Roads, gave an address on "Federal Co-operation in Highway Construction."

The meeting was addressed by Mr. W. W. Mellen, of the Sinclair Gulf Refining Company, on "Methods and Details of Oil Refining."

On motion, duly seconded, a vote of thanks was extended to Mr. Brillhart for his excellent paper on "Suggested Change for the American Society of Civil Engineers."

Mr. J. A. Dutton, of the Texas Willite Road Construction Company, addressed the meeting on "Roads Constructed under the Willite Patent."

On motion, duly seconded, a vote of thanks was extended to the management of the St. Anthony Hotel for the meeting facilities provided.

On motion, duly seconded, a vote of thanks was also extended to the Local Committee for the arrangements made for the meeting.

Adjourned.

Utah Association, Organized 1916.

A. B. Villadsen, President, 304 Dooly Bldg., Salt Lake City, Utah.

The Annual Meeting of the Association is held on the first Wednesday in April. The time of other meetings is not fixed, but this information will be furnished on application to the President.

PRIVILEGES OF ENGINEERING SOCIETIES EXTENDED TO MEMBERS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

Members of the American Society of Civil Engineers will be welcome in the Reading Rooms and at the meetings of many engineering societies in all parts of the world. A list of such societies will be found on pages 41 and 42 of the Year Book of the Society for 1919.

NEW BOOKS*

(From May 1st to July 31st, 1919)

The statements made in these notices are taken from the books themselves, and this Society is not reponsible for them.

DONATIONS TO ENGINEERING SOCIETIES LIBRARY

ELECTRICITY AND MAGNETISM FOR ENGINEERS:

Part II, Electrostatics and Alternating Currents. By Harold Pender. N. Y., McGraw-Hill Book Co., Inc.; Lond., Hill Publishing Co., Ltd., 1919. 221 pp., 172 illus., 9 x 6 in., cloth. $2.00.

The author gives, from an engineering point of view, a description of the more important effects commonly described as electrical and magnetic phenomena, and the application of these laws to some of the simpler problems which arise in connection with the generation, transmission, and utilization of electrical phenomena. The book is intended for college instruction.

MAGNETISM AND APPLICATIONS OF MAGNETS.

By John D. Ball. (School of Practical Electricity, Book 4.) Milwaukee, Electroforce Publishing Co. (copyright 1919). 113 pp., 95 illus., tab., 10 x 7 in., cloth. $1.50. (Gift of Author.)

This volume, which is one of a series of textbooks for technical high schools, trade schools, etc., combines a brief description of the laws and principles of magnetism and the commercial uses of magnets with a selection of laboratory experiments to illustrate the theories of magnetism and electro-magnetism. Only elementary mathematics is used.

CUTTING CENTRAL STATION COSTS:

Ways by Which Central Station Managers, Operating Engineers, and Sales Managers are Meeting High Costs. Compiled by S. B. Williams. N. Y., Published by *Electrical World;* McGraw-Hill Book Co., Inc., Sole Selling Agents, 1919. 322 pp., illus., 9 x 6 in., cloth. $2.00.

The Commercial Editor of the *Electrical World* has here collected the material contributed to that journal during the last nine months of the war, explaining methods adopted by various central stations. Economies in boiler and generating rooms, line construction and distribution methods and substation practice, commercial practice, and administrative plans are discussed.

ELECTRICAL AIDS TO GREATER PRODUCTION:

Plans, Methods, and Appliances by Which Industrial Electrical Engineers are Meeting Increased Demands for Power. Compiled and Edited by Allen M. Perry. N. Y., Published by *Electrical World,* McGraw-Hill Book Company, Inc., 1919. 332 pp., illus., chart, tab., 9 x 6 in., cloth. $2.00.

The Engineering Editor of *Electrical World* has prepared this volume from articles on the application of electricity to plants, which have appeared in that periodical during the last few years. It summarizes the methods that have arisen from the necessity for increased factory output and reduced cost of production, caused by the war, in many classes of industries. Contents: General Power Problems of Industrial Plants; Distribution, Transformation, Switching, and Protection; Motors, Control, Specific Applications, Troubles and Remedies; Illumination—Selection of Equipment, Economies, and Specific Applications; Electric Furnaces, Welding, etc.; Meters and Measurements as Applied to Industries; Handling Material in Industrial Plants with Electric Tractors; Out-door Substations.

*Unless otherwise specified, books in this list have been donated by the publishers.

LABORATORY EXPERIMENTS WITH DIRECT CURRENTS.

By F. E. Austin. [Hanover, N. H., copyright 1917.] 152 pp., illus., 7 x 5 in., flexible cloth. (Gift of Author.)

The subject-matter includes a laboratory course, covering about forty hours, for students in technical and industrial high schools, etc., based on the author's experience as a teacher. The chief aim is to make evident some of the engineering applications of direct currents.

INDUCTION COILS IN THEORY AND PRACTICE.

By F. E. Austin. [Hanover, N. H., copyright 1919.] 64 pp., 45 illus., 9 x 6 in., cloth. $1.00.

This is a presentation of the fundamental principles of the induction coil, for use as a textbook. Intended to enable the student to construct induction coils to meet a variety of demands, as well as to construct coils to fulfill specific requirements.

MARINE INSURANCE:

Its Principles and Practice. By William D. Winter. N. Y., McGraw-Hill Book Co., Inc.; Lond., Hill Publishing Co., Ltd., 1919. 433 pp., 8 x 6 in., cloth. $3.50.

In this treatise, the writer presents a thorough, simple exposition of marine insurance, suited to the needs of shipping men, merchants, and others who require a general knowledge of the subject. The text is based on a course of lectures given at New York University.

ENGINEERING DESCRIPTIVE GEOMETRY AND DRAWING:

A Treatise on Line Drawing, Descriptive Geometry, and Engineering or Mechanical Drawing, for the Use of Midshipmen at the United States Naval Academy. By Frank W. Bartlett and Theodore W. Johnson. N. Y., John Wiley & Sons, Inc.; Lond., Chapman & Hall, Ltd., 1919. 617 pp., illus., pl., tab., 9 x 6 in., cloth. $5.50.

This volume consists of three independent treatises on Line Drawing, Engineering Descriptive Geometry, and Engineering Drawing. Collectively, they represent the course in drawing at the United States Naval Academy and are intended to provide a complete course for students with no previous knowledge of mechanical drawing. Part 1 has been written to replace Bartlett's "Mechanical Drawing." Part 2, which treats of the science of orthographic projection, was issued as a separate work in 1910, and has been revised to date. Part 3, the work of Professor Johnson, deals with the application of Parts 1 and 2 to the needs of engineers, draftsmen, and mechanics, for practical construction of machines of every kind. Part 3 is also issued separately for the use of those who wish a general course in mechanical drawing.

THE AMERICAN MACHINIST SHOP NOTE BOOK:

A Collection of Articles, Written for the American Machinist by Practical Men, Covering a Wide Variety of Machine Shop Activities and Giving the Solutions of Problems That have Arisen in Machine Shops the World Over. Compiled by E. A. Suverkrop. N. Y., Published by *American Machinist;* McGraw-Hill Book Co., Inc., Sole Selling Agents. 301 pp., 223 illus., 9 x 6 in., cloth. $2.00.

A collection of methods for dealing with difficult or unusual machine-shop jobs, compiled from the periodical mentioned, and classified under the contents to facilitate ready reference. The articles show methods that have been successful and are suggestive to the machinist faced by similar difficulties. Contents: Drafting and Design; Patterns and Foundry; Forge Shop, Hardening and Tempering; Drilling Machine; Engine Lathe; The Milling Machine; Planer and Shaper; Tool Making; Die and Press Work; Gages; Grinding; Boring; Gearing; Screw Machine; Shop Tools, Appliances and Expedients.

BOILER CHEMISTRY AND FEED-WATER SUPPLIES.

By J. H. Paul. Lond. and N. Y., Longmans, Green and Co., 1919. 242 pp., 1 pl., tab., diag., 9 x 6 in., cloth. $4.50.

The lack of any adequate discussion of the chemical reactions which occur in high-pressure boilers fed with natural waters, and of the effects of these reactions on the steaming capacity of the boiler and on the metal of which it is made, have led the author to prepare this volume, in which he gives the knowledge gained by long practical experience with boilers under varied circumstances and conditions. As far as possible, he has stated the facts and his conclusions in the language of every-day life.

EXCAVATION:

Machinery Methods and Costs, Including a Revision of "Excavating Machinery." By Allen Boyer McDaniel. N. Y., McGraw-Hill Book Co., Inc.; Lond., Hill Publishing Co., Ltd., 1919. 18 + 542 pp., 209 illus., 9 x 6 in., cloth. $5.00.

Frequent requests for information on recent types of excavators and the newer uses of older types, have led the author of this work to prepare it to replace his "Excavating Machinery", published in 1913. The present work is divided into two sections; the first describes the construction, method and typical cost of operation of each type of excavator, the second is a comparative study of the efficient and economic use of the different types of machines in the various fields of construction work. Highway and railroad construction, reclamation, river, harbor, canal and municipal work, quarrying, tunneling, and mining are considered. References to the literature are included.

LIQUID FUELS FOR INTERNAL COMBUSTION ENGINES:

A Practical Treatise for Engineers and Chemists. By Harold Moore. N. Y., D. Van Nostrand Co., 1918. 15 + 200 pp., 49 illus., tab., 9 x 6 in., cloth. $5.00.

The author describes in Part 1 of this volume the chemical differences between the various fuels, petroleum, shale oil, coal and lignite tars, wood and peat distillation products, oils and alcohols, which are used for internal combustion engines. In Part 2, these fuels are classified according to their suitability for use in engines fitted with carbureters, vaporizers, or atomizers. Part 3, presents methods for the examination and valuation of liquid fuels, with a view to their use in these engines, the procedure in such cases being different from that used in determining their value for external combustion.

MOTOR VEHICLE ENGINEERING:

Engines (For Automobiles, Trucks, and Tractors). By Ethelbert Favary. N. Y., McGraw-Hill Book Company, Inc.; Lond., Hill Publishing Co., Ltd., 1919. 12 + 333 pp., 133 illus., 39 tab., 9 x 6 in., cloth. $3.00.

The present volume, the first of a contemplated series intended to give designers, engineers, and students a concise summary of modern practice in automobile design and construction, deals with engines. It illustrates standard designs for all engine parts and gives the formulas for determining the strength and dimensions of these parts, together with other useful information. Only simple mathematics is used.

PUMPING MACHINERY:

A Treatise on the History, Design, Construction, and Operation of Various Forms of Pumps. By Arthur M. Greene, Jr. 2d Edition, Revised. N. Y., John Wiley & Sons, Inc.; Lond., Chapman & Hall, Ltd., 1919. 703 pp., 504 illus., tab., 9 x 6 in., cloth. $4.00.

Gives a brief, historical review of the development of pumping machinery, describes the action of a number of common forms of pumps and states the methods of design of pumping apparatus. It is intended to develop certain general principles of mechanics which are applicable to pumping machinery, as well as to train the student in application of the theoretical portions of an engineering course. The descriptive chapters on modern pumps have been prepared from the catalogues and bulletins of manufacturers and from current technical literature. A full bibliography is included.

AIRPLANE DESIGN AND CONSTRUCTION.

By Ottorino Pomilio. N. Y., McGraw-Hill Book Company, Inc.; Lond., Hill Publishing Company, Ltd., 1919. 403 pp., 248 illus., 58 tab., 9 x 6 in., cloth. $5.00.

A book on the structure and design of airplanes, in which the results of European experimental research in aero-dynamics are presented in considerable detail. The problems relating to airplane design and operation are analyzed, working formulas are derived, and the data needed by designers are presented.

ABRASIVES AND ABRASIVE WHEELS:

Their Nature, Manufacture, and Use; A Complete Treatise on the Manufacture and Practical Use of Abrasives, Abrasive Wheels, and Grinding Operations. By Fred B. Jacobs. N. Y., The Norman W. Henley Publishing Co., 1919. 338 pp., 174 illus., 1 por., 8 x 5 in., cloth. $3.00.

This work opens with descriptions of the various natural and artificial abrasives, the manufacture of grinding wheels and artificial sharpening stones, the grades established in commerce, and the methods of testing grinding wheels. Chapters follow on the care of wheels, dust collecting systems and safeguards, abrasive papers and cloths, methods of surface, cylindrical, and internal grinding, special grinding operations, and cutter and saw sharpening. The author writes from experience as a machinist and as a salesman of grinding wheels.

PRACTICAL SHELL FORGING

And the Plastic Deformation of Steel and Its Heat Treatment. By Clifford O. Bower. N. Y., Longmans, Green & Co., 1919. 279 pp., 152 illus., 4 pl., 17 tables, 10 x 6 in., cloth. $10.50.

This volume, by an experienced British forge master, is a detailed account of the processes of shell manufacture, in which particular attention is given to the laws governing the plastic deformation of steel at high temperatures and the variations in its physical character to be obtained by thermal treatment. It will be useful indirectly, the author hopes, to all persons engaged in the manufacture of hydraulic forgings.

MILITARY GEOLOGY AND TOPOGRAPHY:

A Presentation of Certain Phases of Geology, Geography, and Topography for Military Purposes. Herbert E. Gregory, Editor. Prepared and Issued under the Auspices of the Division of Geology and Geography, National Research Council. New Haven, Yale University Press, 1918. 281 pp., illus., pl., maps, 9 x 6 in., cloth. $1.25.

This book is the result of a preliminary effort to meet the need which the Great War has demonstrated for a more widely diffused knowledge of geology as an aid in conducting military operations and in the solution of economic problems relating to raw materials. Attention is given mainly to those facts and principles that have proven to be applicable to military problems. Bibliographies for supplementary reference study are included.

THE CANADIAN MINING MANUAL, 1918:

A Handbook of Information Concerning the Minerals and Mines of Canada. Edited by Reginald E. Hore. Toronto, Mines Publishing Co. (copyright 1919). 352 pp., illus., pl., por., maps, tab., diag., 11 x 9 in., cloth. $5.00.

This is the fourth edition of this handbook of Canadian minerals, metals, mining, and metallurgical companies, in which the chief objects are to present concisely matters of interest to persons connected with the mining industry and to attract attention to the possibilities of Canadian mineral resources. A preliminary survey of progress in 1918 and a summary of the official reports for 1917 are given for each province and product. There are also a number of special articles on topics of interest, a directory of mining companies, and a list of the producers of various mine products.

STANDARDIZATION OF MINING METHODS.

By Charles A. Mitke. A Series of Important Articles Reprinted from *Engineering and Mining Journal.* N. Y., Published by *Engineering and Mining Journal,* McGraw-Hill Book Co., Inc., 1919. 110 pp., 47 illus., 6 charts, 4 tab., 7 x 5 in., cloth. $1.50.

As mining engineer for the Phelps Dodge Corporation, the author has studied mining practices in detail, with a view to the establishment of standard methods. The present volume is based on his experience and is an account of the standardization of various mining practices in the interests of safety and economy.

MINERAL DEPOSITS.

By Waldemar Lindgren. 2d Edition. N. Y., McGraw-Hill Book Company; Lond., Hill Publishing Co., Ltd., 1919. 957 pp., illus., tab., 9 x 6 in., cloth. $5.00.

Mineral deposits are usually classified and described by the metals or substances which they contain; for instance, deposits of copper are described together, with little or no effort to separate them into genetic groups. This book is the outcome of a desire to place the knowledge of mineral deposits on the broader and more comprehensive basis of a consistent genetic classification, and thus bring it into a more worthy position as an important branch of geology. In this second edition, all the chapters have been revised and several have been largely rewritten. A discussion of metallogenetic epochs has been added, as well as an index by elements. Some less essential descriptions have been excised, in order that the book might not increase in bulk.

MATHEMATICS FOR ENGINEERS:

Part I, Including Elementary and Higher Algebra, Mensuration and Graphs, and Plane Trigonometry. By W. N. Rose. (The Directly-Useful Technical Series.) N. Y., E. P. Dutton & Co. (1919). 510 pp., 257 illus., 11 tab., 9 x 6 in., cloth. $5.00.

This treatise endeavors to cover all the mathematical work needed by students and engineers in their practice, and is intended also to serve as a reference book for private study. Part I deals with the fundamental rules and processes of Algebra, Plane Trigonometry, Mensuration, and Graphs. Practical applications having a direct bearing on engineering practice are added in the greater number of instances, and many calculations, tables, and charts, designed to make the book of the greatest possible assistance to busy engineers, are included.

JAMES WOODHOUSE, A PIONEER IN CHEMISTRY, 1770-1809.

By Edgar F. Smith. Phila., The John C. Winston Co., 1918. 299 pp., 1 pl., 1 por., 8 x 5 in., cloth. $1.50.

Dr. Smith's account of the life and labors of James Woodhouse is a valuable contribution to the early history of chemistry in America. Woodhouse was elected Professor of Chemistry at the University of Pennsylvania in 1795 and retained this connection until his death in 1809. He was an industrious and ingenious chemist, who by his work and writings did much to establish the teaching of chemistry on a sound basis and to arouse interest in the industrial applications of the science.

THE APPLICATIONS OF ELECTROLYSIS IN CHEMICAL INDUSTRY.

By Arthur J. Hale. (Monographs on Industrial Chemistry.) Lond. and N. Y., Longmans, Green and Co., 1918. 148 pp., 56 illus., 9 x 6 in., cloth. $2.50.

The author describes briefly the electrolytic refining and winning of metals, the production of hydrogen and oxygen, chlorin, caustic soda, hypochlorites, chlorates and perchlorates, and of various other organic and inorganic compounds. References to the literature and patents are included.

A SYSTEM OF PHYSICAL CHEMISTRY.

By William C. McC. Lewis. 2d Edition. N. Y. and Lond., Longmans, Green and Co., 1918. 3 vol., diagrams, 9 x 6 in., cloth. $4.50.

Professor Lewis' work is intended as a general textbook for use by those who already possess some knowledge of both physics and chemistry and as a fairly comprehensive account of our present knowledge of the subject. It is well equipped with references to the original literature, and, therefore, is useful for reference use. A third volume, on the Quantum theory, has been added in this edition. Other changes, necessitated by the advances made since the previous edition, have caused considerable expansion of the book.

AN INTRODUCTION TO THE PHYSICS AND CHEMISTRY OF COLLOIDS.

By Emil Hatschek. 3d Edition. Phila., P. Blakiston's Son and Co., 1919. 116 pp., 17 illus., 7 x 5 in., cloth. $1.50.

This small volume is intended to introduce readers with a reasonable knowledge of physics and chemistry, to the fundamental facts and methods of this important branch of physical chemistry. Small additions and corrections have been made to this edition, to include such recent advances as fall within the scope of a brief introductory work.

A CENTURY OF SCIENCE IN AMERICA:

With Special Reference to the *American Journal of Science,* 1818-1918. By Edward Salisbury Dana and others. New Haven, Yale University Press, 1918. 458 pp., 22 por., 9 x 6 in., cloth. $4.00.

The present book commemorates the 100th anniversary of the founding of the *American Journal of Science* by Benjamin Silliman, in July, 1818. The opening chapter gives a somewhat detailed account of the early days of the *Journal,* with a sketch of its subsequent history. The remaining chapters are devoted to the principal branches of science which have been prominent in the pages of the *Journal,* namely, geology, paleontology, mineralogy, chemistry, physics, zoology, and botany. These chapters have been written with a view to showing in each case the position of the science in 1818 and the general progress made during the century. Special prominence is given to American science, and, particularly, to the contributions to it to be found in the pages of the *Journal.*

THE TURNOVER OF FACTORY LABOR.

By Sumner H. Slichter. With an Introduction by John R. Commons. N. Y. and Lond., D. Appleton & Co., 1919. 460 pp., tables, 8 x 5 in., cloth. $3.00.

The author intends this volume to be a comprehensive study of methods of handling men, to supplement existing books on works management. It is founded on personal experience in large industrial plants, visits to factories, talks with employers and workingmen, schedules, and questionnaires. As the study was begun in 1913, and most of the data were collected before the acute situation of 1916, the discussion is from the standpoint of the situation in peace times. The book deals with manual laborers generally, except out-of-door seasonal workers. Contents: General Analysis of the Turnover; The Cost of the Turnover; The Causes of the Turnover; Methods of Reducing the Turnover.

THE BLIND:

Their Condition and the Work Being Done for Them in the United States. By Harry Best. N. Y., The Macmillan Co., 1919. 17 + 763 pp., illus., tab., 8 x 6 in., cloth. $4.00.

The particular sections of this comprehensive survey likely to interest engineers are those treating of the industrial employment of the blind and of indemnities for the loss of sight. Both topics are given full consideration. Attention is given to the theoretical aspects of industrial establishments for the blind, the organization and results of present establishments, and the possible and present employment of the blind in general occupations. The payment of indemnities through suits at law, insurance policies, and workingmen's compensation acts is also described very fully.

MacRAE'S BLUE BOOK.

Chic. and N. Y., MacRae's Blue Book Co., 1919. 1846 pp., 12 x 9 in., cloth. $10.00.

This record of manufacturers is intended for use by purchasing agents interested in iron and steel products, building materials, railway supplies, etc. It includes an alphabetical address list of the principal manufacturers in the United States, a classified index of the makers of 10 000 products, an index of trade names, a collection of miscellaneous data useful to purchasers and users of the articles considered, and the standard list prices of building materials, iron and steel products, etc.

EFFICIENT RAILWAY OPERATION.

By Henry S. Haines. N. Y., The Macmillan Co., 1919. 709 pp., tab., 9 x 6 in., cloth. $4.50.

This volume is a description of the progressive development of efficiency in the operation of the railway system in the United States, as compared with similar progress in other countries, for the use of students, railway employees, and general readers. Railway operation, as distinguished from administration, is the subject of the book; matters of finance, rates, and labor questions, therefore, are not included. A bibliography and extensive statistical tables are given in the appendixes.

TRAINING FOR THE ELECTRIC RAILWAY BUSINESS.

Written Under the Supervision of T. E. Mitten, by B. B. Fairchild, Jr. Phila. and Lond., J. B. Lippincott Co., 1919. 155 pp., 9 pl., 3 charts, 8 x 5 in., cloth. $1.50.

Explains in non-technical language the business side of electric railroading, and gives an insight into the requirements, the opportunities, and the training involved in the several departments. The various engineering and transportation problems are taken up, and the recruiting and management of the army of laborers needed thoroughly discussed.

PRACTICAL HELPS FOR THE ELECTRIC RAILWAY SHOP.

Track, Power, Line, and Rolling Stock Departments. Compiled from the Mechanical and Engineering Edition of *Electric Railway Journal.* N. Y., published by *Electric Railway Journal,* McGraw-Hill Book Company, Inc., 1919. 331 pp., illus., tab., 9 x 6 in., cloth. $2.00.

These extended articles have been selected from a series published in the *Electric Railway Journal,* which was prepared for the information of men responsible for the upkeep of the physical equipment of an electric railway system. The articles cover the fundamentals of the various subjects in a broad, practical manner. Contents: Track and Structures, by R. C. Cram; Power Generation, by Hartley LeH. Smith; Power Transmission, by Charles R. Harte; Car Design, by Norman Litchfield; Car Equipment, by C. W. Squier.

HANDBOOK FOR HIGHWAY ENGINEERS:

Containing Information Ordinarily Used in the Design and Construction of Rural Highways. By Wilson G. Harger and Edmund A. Bonney. 3d Edition, Entirely Revised. N. Y., McGraw-Hill Book Co.; Lond., Hill Publishing Co., Ltd., 1919. 986 pp., illus., tab., 1 map, 7 x 4 in., flexible cloth. $4.00.

This handbook is a compact volume, presenting in convenient form the information ordinarily required in the field and office practice of road design and construction, and is planned to meet the requirements of both experienced and inexperienced road men. In the present edition, approximately 350 pages of new material have been incorporated, covering mountain road location and design, camp equipment, medical notes, photography, selected soil and gravel treatment of moderate traffic roads, and the recent developments of hard surface roads.

TIMBER: ITS STRENGTH, SEASONING, AND GRADING.

By Harold S. Betts. N. Y., McGraw-Hill Book Company, Inc.; Lond., Hill Publishing Company, 1919. 234 pp., illus., maps, charts, tab., 9 x 6 in., cloth. $3.00.

This volume, for engineers, manufacturers, and users of lumber and wood material, is intended to meet the lack of a work on wood as a structural material, similar to existing handbooks on steel, concrete, etc. The methods of testing the strength of wood and wood products, such as telephone poles, packing boxes, and vehicle parts, are described, and the results of numerous tests by the Forest Service are tabulated. A table based on 130 000 tests, showing the average mechanical properties of 124 American woods, is given. Proper methods of seasoning wood are fully discussed. The grading rules of the different Manufacturers' Associations are given, and the book closes with extensive statistics on the lumber produced and used in the United States.

THE ELEMENTS OF ASTRONOMY FOR SURVEYORS.

By R. W. Chapman. Lond., Charles Griffin and Company, Ltd.; Phila., J. B. Lippincott Co., 1919. 247 pp., tab., 56 diag., 8 x 6 in., cloth. $1.75. (Gift of J. B. Lippincott Co.)

The author of this small volume has attempted to provide students of surveying with an elementary exposition, not only of the practical methods of observation and computation, but also of the main principles by which the formulas are derived. The methods of observation are illustrated by fully worked out actual observations, and prominent attention is given to the effects of observational and instrumental errors.

SHORE PROCESSES AND SHORE LINE DEVELOPMENT.

By Douglas Wilson Johnson. N. Y., John Wiley and Sons, Inc.; Lond., Chapman & Hall, Ltd., 1919. 17+584 pp., 149 illus., 73 pl., 9 x 6 in., cloth. $5.00.

Professor Johnson has recorded in compact form the result of an extended study of the scattered literature on shore processes and shore line forms. Water waves, the work of waves, current action, the development of the shore profile and the shore line, shore ridges, and minor shore forms are discussed, and a statement of the fundamental principles which seem best established, is given. The author hopes that the book will prove useful to engineers, geologists, and geographers. Full lists of references and a bibliography are included.

DONATIONS TO THE READING ROOM

FOWLER'S ELECTRICAL ENGINEER'S POCKET BOOK, 1919.

Edited by William H. Fowler. 19th Annual Edition. Manchester, England, Scientific Publishing Company, 1919. 46+512 pp., illus., tab., 6 x 4 in., cloth. 3 shillings 4 pence.

This book, it is stated, contains exhaustive information on electrical engineering rules, as well as tables and data on electrical units, magnets, and magnetism, physical properties of metals, conductors, insulating materials, electric lighting and welding, comparison and measurement of resistances, testing sets, electrical measuring instruments and meters, primary and secondary batteries, dynamos and motors, electric currents, etc., etc.

FOWLER'S MECHANICS' AND MACHINISTS' POCKET BOOK, 1919.

Edited by William H. Fowler. 11th Annual Edition. Manchester, England, Scientific Publishing Co., 1919. 46+464 pp., illus., tab., 6 x 4 in., cloth. 2 shillings 9 pence.

In a secondary title, it is stated that this book is a synopsis of practical rules for fitters, turners, millwrights, erectors, pattern-makers, foundrymen, draftsmen, apprentices, and students, on machine tool design, metal cutting tools, milling cutters, high-speed tool steels, drilling and boring metals, screw-threads, screw cutting and taper turning, precision grinding, shop practice, etc., etc.

FOWLER'S MECHANICAL ENGINEER'S POCKET BOOK, 1919.

Edited by William H. Fowler. 21st Annual Edition. Manchester, England, Scientific Publishing Co., 1919. 62+576 pp., illus., tab., 6 x 4 in., cloth. 3 shillings 4 pence.

This small volume, it is stated, contains nearly 600 pages of rules, tables, and data for mechanical engineers, power users, engine attendants, draftsmen, students, etc., on steam boilers, steam engines, design of valves and gears, locomotives, steam turbines, gas and oil engines, gases used in gas engines, rope and belt driving, wheel gearing, ball and roller bearings, lubrication, proportions of spiral and plate springs, hydraulics, etc., etc.

THE CIVIL ENGINEER'S POCKET-BOOK.

By John C. Trautwine. Revised by John C. Trautwine, Jr., and John C. Trautwine, 3d. 20th Edition. Phila., Trautwine Company, 1919. 1528 pp., illus., tab., 7 x 4 in., flexible cloth. $6.00.

In preparation for this edition of this well-known pocket-book for civil engineers, the original of which was first published in 1872, the compilers, have confined themselves, except for radical and important improvements in the arrangement of several articles and the correction of all known errors in the text, to the modernization and extension of certain railroad subjects and the introduction of entirely new matter on others, the new matter approximating about 400 pages. The rules relating to the Ellipse also have been modernized, extended, and rewritten, a new Isogonic Chart is given, and the Table of Azimuths of Polaris has been revised to cover present dates.

MEMBERSHIP

(From May 9th to August 7th, 1919.)

ADDITIONS

MEMBERS		Date of Membership.
BAILLIE, FRANK SEYMOUR. Office Mgr., Grant Smith Porter Ship Co., Hotel Portland, Portland, Ore.		May 12, 1919
BARRETT, ROBERT EDWARD. Constr. Engr., Turners Falls Power & Elec. Co.; Gen. Mgr. and Chf. Engr., Connecticut River Conservation Co. (Res., 12 Marshall St.), Turners Falls, Mass.	Jun. Assoc. M. M.	Jan. 31, 1905 Dec. 6, 1910 June 16, 1919
BISHOP, LYMAN EDGAR. Civ., Hydr., and Irrig. Engr., 1213 First National Bank Bldg., Denver, Colo.	Jun. Assoc. M. M.	May 4, 1909 Oct. 31, 1911 June 16, 1919
BUCKBEE, NEIL STANLEY. Engr. and Dist. Mgr., Corrugated Bar Co., 537 Woodlawn Ave., Buffalo, N. Y.		June 16, 1919
BUMSTED, EUGENE BRADFORD. Cons. Engr., 908 Insurance Exchange Bldg., San Francisco, Cal.	Jun. Assoc. M. M.	May 1, 1900 Mar. 6, 1907 June 16, 1919
CALDWELL, FRED EDWARD. 67 Midland Ave., East Orange, N. J.	Jun. Assoc. M. M.	April 3, 1906 Feb. 1, 1910 May 12, 1919
CARTER, EDWARD FAIRBANK. Mgr. and Chf. Engr., John S. Metcalf Co., Ltd., National Mutual Bldg., Melbourne, Victoria, Australia		Mar. 11, 1919
CHARTON, PIERRE. Cons. Engr., 516 Transportation Bldg., Montreal, Que., Canada		May 12, 1919
CHITTENDEN, ALBERT FREDERICK. Capt., Engrs., U. S. A., 4106 Burke Ave., Seattle, Wash.	Assoc. M. M.	Mar. 14, 1916 April 14, 1919
CORNELL, JOHN WESLEY. Capt., Q. M. C., U. S. A., 411½ Columbia Rd., Washington, D. C.	Assoc. M. M.	June 30, 1910 June 16, 1919
DENNIS, WALTER. Maj., Q. M. C., U. S. A., Constr. Div., Moberly, Mo.		June 16, 1919
FARRIS, JOHN. Pres. and Gen. Mgr., Farris Eng. Co., Empire Bldg., Pittsburgh, Pa.	Assoc. M. M.	Aug. 31, 1915 May 12, 1919
FICHTHORN, JOSEPH HOOVER. Chf. Engr., Lewis F. Shoemaker & Co., Pottstown, Pa.		June 16, 1919
FITCH, JOSIAH HUNTINGTON. Engr. in Chg., Eng. Bureau, Dept. of Street Impvts., Borough of The Bronx, 2440 Devoe Terrace, New York City		May 12, 1919
FLICK, JOHN KRAMER. Engr. and Contr. (Farmer & Flick), 15 East Fayette St. (Res., 2611 Guilford Ave.), Baltimore, Md.	Jun. Assoc. M. M.	Jan. 31, 1911 July 2, 1913 June 16, 1919

MEMBERS (*Continued*)

		Date of Membership.
GILMAN, CHARLES EDWARD. Civ. and Min. Engr. (Duryea, Haehl & Gilman), 1314 Humboldt Bank Bldg., San Francisco, Cal.	Jun.	Oct. 6, 1903
	Assoc. M.	Dec. 5, 1906
	M.	June 16, 1919
GRIER, ARTHUR JAY. Contr. Engr., 480 Chetwood St., Oakland, Cal.		June 16, 1919
GUNBY, FRANK MCCLELLAN. With Charles T. Main, 201 Devonshire St., Boston, Mass.		May 12, 1919
HALL, SAMUEL PRESCOTT. (Allen & Hall), 36 Winner Ave., Columbus, Ohio		Jan. 13, 1919
HAND, GEORGE TROWBRIDGE. Chf. Engr., Lehigh Val. R. R., 475 Vose Ave., South Orange, N. J.		May 12, 1919
HARKNESS, ANDREW HARKNESS. Cons. Engr., 239 Confederation Life Bldg., Toronto, Ont., Canada		June 16, 1919
HAYDEN, FRANK DEMETRIUS. Asst. Prof. of Railroad Eng., Univ. of Washington, 1906 East 65th St., Seattle, Wash.	Assoc. M.	May 31, 1916
	M.	May 12, 1919
HAYDOCK, WINTERS. Capt., Ord., U. S. A., 3119 Thirteenth St., N. W., Washington, D. C.		May 12, 1919
HEALEY, CHARLES FRANK. Engr. of Contracts, Bureau of Eng., Dept. of Public Works, 402 City Hall, Chicago, Ill.	Assoc. M.	June 30, 1910
	M.	Oct. 9, 1917
HEISER, ALFRED BRACKENRIDGE. Engr., Turner Constr. Co., 244 Madison Ave., New York City (Res., 26 Seventy-first St., Brooklyn, N. Y.)	Jun.	Nov. 1, 1910
	Assoc. M.	June 24, 1914
	M.	June 16, 1919
HENNEBIQUE, JULES JOSEPH. Pres. and Chf. Cons. Engr., Case Coast Protection Corporation, 1170 Broadway, New York City		May 12, 1919
HESS, JOHN STRIDER. Chf. Engr., Sinclair Refining Co., 923 Conway Bldg., Chicago, Ill.	Jun.	Oct. 5, 1909
	Assoc. M.	July 2, 1913
	M.	June 16, 1919
HODGDON, BENJAMIN ALEXANDER. Section Engr. in Chg. of Section 5, Routes 4 and 36, Dual Subway System, New York City, 24 Rutledge Ave., East Orange, N. J.	Assoc. M.	Mar. 2, 1909
	M.	Jan. 14, 1919
IBARGÜEN Y PI, ALBERTO ANGEL. Chf. Engr., Dist. of Pinar del Rio, Dept. of Public Works, Marti 51, Pinar del Rio, Cuba	Assoc. M.	June 23, 1916
	M.	June 16, 1919
JACOBS, ROBERT HYDE. Div. Engr. of Tracks, Public Service Comm., First Dist., 49 Lafayette St., New York City	Assoc. M.	May 4, 1904
	M.	June 16, 1919
JOHNSON, JOHN MONROE. Marion, S. C.	Assoc. M.	Nov. 27, 1917
	M.	June 16, 1919

MEMBERS (*Continued*)

		Date of Membership.
JUNKERSFELD, PETER. 147 Milk St., Boston, Mass.		June 16, 1919
KASSEBAUM, FREDERICK WILLIAM, JR. Engr. of Constr., Baltimore Dry Docks & Shipbuilding Co., East Fort Ave., Baltimore, Md.	Assoc. M. M.	April 2, 1912 May 12, 1919
KELLY, EDWARD JOSEPH. Asst. Chf. Engr., San Dist. of Chicago, 910 South Michigan Ave., Room 700, Chicago, Ill.		June 16, 1919
KEMMLER, EDWARD ALBERT. Engr. of Highways, Dept. of Public Service, Delaware Bldg., Akron, Ohio		May 12, 1919
KING, MAX WERNER. Dist. Mgr., Empire Eng. Co., Inc., 28 Beard Ave., Buffalo, N. Y.		May 12, 1919
KIRKHAM, JOHN EDWARD. Prof. of Structural Eng., Iowa State Coll.; Acting Head, Civ. Eng. Dept., Iowa Highway Comm., Ames, Iowa	Assoc. M. M.	Feb. 7, 1906 June 16, 1919
LANSDALE, JOHN. Maj., Engrs., U. S. A.; Chf., Railroad and Dock Constr. Section, D. C. and F., A. P. O. 717, Am. Exp. Forces, Tours, France	Assoc. M. M.	Sept. 11, 1917 April 14, 1919
LARUE, EUGENE CLYDE. Hydr. Engr., U. S. Geological Survey, Federal Bldg., Pasadena, Cal.	Assoc. M. M.	Jan. 4, 1910 June 16, 1919
LEAF, JAMES PINNEY. 290 West Park, Rochester, Pa.		April 14, 1919
LEE, CHARLES HAMILTON. Capt., Engrs., U. S. A., 2629 Piedmont Ave., Berkeley, Cal.	Jun. Assoc. M. M.	Jan. 2, 1906 Jan. 31, 1911 June 16, 1919
LEWIS, LUTHER HAMMOND. Archt. (Crow, Lewis & Wick), 200 Fifth Ave., New York City.	Assoc. M. M.	April 6, 1904 May 12, 1919
MCGREGOR, ROBERT ROY. 1818 Bath St., Santa Barbara, Cal.	Assoc. M. M.	Mar. 6, 1907 April 14, 1919
MADDEN, JOHN HENRY. 515 West 111th St., New York City.	Jun. Assoc. M. M.	Oct. 7, 1902 May 4, 1904 June 16, 1919
MARSHALL, RICHARD COKE, JR. Brig.-Gen., U. S. A., The Farnsboro, Washington, D. C.		May 12, 1919
MERRIAM, JUDSON HUNTOON. Res. Engr., C., B. & Q. R. R., Bridgeport (Res., Lincoln), Nebr.		June 16, 1919
NEEL, WARREN RABUN. State Highway Engr.; Secy. and Treas., State Highway Dept., 883 West Peachtree St., Atlanta, Ga.		May 12, 1919
NEELY, JOHN BURCHFIELD. Chf. Engr., Kansas City Bridge Co., 510 Orear Leslie Bldg., Kansas City, Mo.		May 12, 1919

MEMBERS (*Continued*)

		Date of Membership.
OLDS, ALBERT ROY. Engr., M. of W., Havana Elec. Ry., Light & Power Co., Box 570, Havana, Cuba	Assoc. M.	May 15, 1917
	M.	May 12, 1919
OREN, FRED BAILEY. Engr. and Contr., St. Elmo, Ill		April 14, 1919
PAUL, CHARLES EDWARD. Cons. Engr.; Prof. of Mechanics, Armour Inst. of Technology, Chicago, Ill		May 12, 1919
PELLISSIER, GEORGE EDWARD. Asst. Gen. Mgr. and Chf. Engr., Holyoke St. Ry., Holyoke, Mass.	Jun.	Feb. 28, 1905
	Assoc. M.	July 1, 1909
	M.	June 16, 1919
PERKINS, FRANK EDSON. Engr., Butterworth-Judson Corporation, Newark Transfer, Newark, N. J. (Res., 297 Farmington Ave., Hartford, Conn.)		May 12, 1919
RAPP, FRANK ARTHUR. Bridge Engr., City of Seattle, 600 County and City Bldg., Seattle, Wash.		June 16, 1919
ROBERTS, WARREN RUSSELL. Pres. and Chairman, Board of Directors, Roberts & Schaefer Co., 2064 McCormick Bldg., Chicago, Ill.		May 12, 1919
ROBINSON, ERNEST FRANKLIN. 118 Twenty-eighth St., Newport News, Va.	Jun.	Mar. 3, 1908
	Assoc. M.	Oct. 4, 1910
	M.	April 14, 1919
RUTH, EDGAR KINGSBURY. Asst. Prof. of Civ. Eng., Univ. of Cincinnati, Cincinnati, Ohio	Jun.	May 2, 1911
	Assoc. M.	July 2, 1913
	M.	June 16, 1919
SAMUELSON, BERNHARD MARTIN. 3 The Crescent, Scarborough, England		Mar. 11, 1919
SLOCUM, CURLYS LYON. Capt., Ord., U. S. A.; Asst. to Commanding Officer, Springfield Arsenal (Res., 30 Armory St.), Springfield, Mass.	Jun.	Jan. 3, 1905
	Assoc. M.	July 9, 1906
	M.	June 16, 1919
STERLING, PAUL. Maintenance Engr., Lines West and C. N. E., N. Y., N. H. & H. R. R., New Haven, Conn.		May 12, 1919
STOCKER, LESLIE WRIGHTSON. Asst. Engr., City Engr.'s Office, 3450 Geary St., San Francisco, Cal.	Assoc. M.	June 24, 1914
	M.	June 16, 1919
SYKES, GEORGE. (George Sykes Co.), 70 East 45th St., New York City	Jun.	May 1, 1906
	Assoc. M.	Dec. 4, 1907
	M.	May 12, 1919
TAY, SAMUEL WRIGHT. San. Engr., 2413 Lower Manoa Rd., Honolulu, Hawaii	Assoc. M.	June 24, 1914
	M.	June 16, 1919
TOWNSEND, JOSEPH BOYER. Southwestern Mgr., Div. of Constr. and Eng., Stone & Webster, 1008 Texas Ave., Houston, Tex.		May 12, 1919
WESTON, BENJAMIN THOMAS. Res. Engr., H. S. Ferguson, Temiskaming, Que., Canada	Assoc. M.	Sept. 3, 1912
	M.	June 16, 1919

MEMBERS (*Continued*)

	Date of Membership.
WETZLER, WILLIAM HENRY. Cons. Engr.; Prin. Surveyor of Concrete Ships, Am. Bureau of Shipping, 66 Beaver St. (Res., 120 Haven Ave.), New York City	April 14, 1919
WILSON, WILLIAM. Archt. and Engr., 53 Akashi-cho-Tsukiji, Tokyo, Japan	Assoc. M. Feb. 6, 1912 M. Jan. 14, 1919
WRIGHT, CLARK CHITTENDEN. Col., Q. M. C., U. S. A., Constr. Div., Apartment 301, The Rochambeau, Washington, D. C.	May 12, 1919
YATES, GEORGE STEVENSON. 68 rue du Lombard, Brussels, Belgium	May 12, 1919

ASSOCIATE MEMBERS

ALLING, ARTHUR RICH. 326 Gazette Bldg., Little Rock, Ark.	May 12, 1919
ANDERSON, ANDREW ELLIOTT. Box 189, Brownsville, Tex.	Jan. 13, 1919
ARNESON, EDWIN PERCIVAL. Irrig. and Highway Engr. (Walton & Arneson), 418 Gunter Bldg., San Antonio, Tex.	May 12, 1919
BADT, ROY ARIN. Cons. Engr. (Badt & Fisher), 74 New Montgomery St., San Francisco, Cal.	May 12, 1919
BALL, WENDELL PHILIP. Asst. Div. Engr., B. & O. R. R., New Castle, Pa.	Jan. 13, 1919
BARRETT, PETER THORNTON. Capt., Q. M. C., U. S. A., Constr. Div., 1330 Fairmount St., N. W., Washington, D. C.	June 16, 1919
BATES, GEORGE WHITNEY. City Engr., City Hall, Lincoln, Nebr.	June 16, 1919
BEER, FREDERICK MAX. Civ. Engr., Tank Shipbuilding Corporation, 240 Cooper St., Brooklyn, N. Y.	June 16, 1919
BENGEL, GEORGE ADAM. 808 South 4th St., Springfield, Ill.	June 16, 1919
BETTS, CLIFFORD AULL. Engr. of Constr., Standard Ground Rock Phosphate & Fertilizer Co., Centerville, Tenn.	Jun. Sept. 12, 1916 Assoc. M. May 12, 1919
BEUTTENMULLER, RUDOLF WILLIAM. Supt. of Dredging, Philadelphia Quartermaster Terminal, 5309 North 12th St., Philadelphia, Pa.	April 14, 1919
BIRD, HAROLD CRUSIUS. Prof. of Civ. Eng., Pennsylvania Military Coll., 2114 Madison St., Chester, Pa.	Jun. Nov. 27, 1917 Assoc. M. May 12, 1919
BISSELL, CHARLES ARTHUR. Engr., U. S. Reclamation Service, 539 Randolph St., N. W., Washington, D. C.	June 16, 1919
BLACKWELL, LINUS CRAMBLET. 1st Lieut., Engrs., U. S. A., 602d Engrs., Am. Exp. Forces; Address, Gen. Delivery, Bellevue, Pa.	Mar. 12, 1918

ASSOCIATE MEMBERS (*Continued*)

	Date of Membership.
BLYTH, ALEXANDER WATT. Estimator and Engr., Stillman-Delehanty-Ferris Co., 26 Exchange Pl., Jersey City, N. J.	June 16, 1919
BONNEY, GUY. 1730 North Calvert St., Baltimore, Md.	Mar. 11, 1919
BOWEN, EDWARD WITHERS. With The Hydr. Steelcraft Co., Cleveland, Ohio.	Jun. Nov. 12, 1913 Assoc. M. May 12, 1919
BRUCE, ERNEST ARDEN. 1222 Lee St., Charleston, W. Va.	April 14, 1919
BURR, FRANK MARVIN. Chf. Engr., Anglo-American Mill Co., 322 Clay St., Owensboro, Ky.	June 16, 1919
CHAMBERS, CHARLES. 530 Fifteenth Ave., West, Calgary, Alberta, Canada.	June 16, 1919
CHAPMAN, RONALD FARQUHAR. Ferncot, Staines, Middlesex, England.	Mar. 11, 1919
CLARK, FRANK JOSHUA. Junior Engr., U. S. Engr. Dept., First Dist., 500 West 143d St., New York City.	June 16, 1919
CLARK, HALE AUSTIN. Senior Structural Engr., Bureau of Valuation, Interstate Commerce Comm., 649 North Fulton Ave., Baltimore, Md.	April 14, 1919
CLAY, JAMES SINGLETON. Highway Bridge Engr., U. S. Bureau of Public Roads, 1743 F St., N. W., Washington, D. C.	May 12, 1919
CONNER, PERLEY EUGENE. Junior Engr., San. Dist. of Chicago, 712 Ash St., Winnetka, Ill.	April 14, 1919
CRAIG, WALTER DUNLAP. 3200 Clifton Ave., Baltimore, Md.	April 14, 1919
CUFF, JAMES EDWARD. Care, New York State Highway Comm., Syracuse, N. Y.	May 12, 1919
CURTIS, BENJAMIN JOHN. Res. Engr., San. Dist. of Chicago, 473 Elm St., Blue Island, Ill.	Jun. Sept. 2, 1914 Assoc. M. June 16, 1919
CURTISS, GREY WILLIS. Track Superv., N. Y., N. H. & H. R. R., 15 Academy St., South Braintree, Mass.	June 16, 1919
DALEN, JOHN ALBERT. Structural Engr., E. F. Terry Mfg. Co., Springfield Gardens, N. Y.	June 16, 1919
DANIELLS, PAUL ASHMORE. 284 Main St., Greenville, Pa.	May 12, 1919
DAVIS, RAYMOND EARL. 1st Lieut., Engrs., U. S. A., 641 O'Farrell St., San Francisco, Cal.	May 12, 1919
DEAN, NORMAN DOUGLAS. Lt.-Col., Engrs., U. S. A., Harbor St. and Sheridan Rd., Glencoe, Ill.	April 14, 1919
DE LEUW, CHARLES EDMUND. (Gates & De Leuw), 1742 Monadnock Blk., Chicago, Ill.	Jun. Aug. 31, 1915 Assoc. M. June 16, 1919
DENNETT, ROBERT CLARK. Engr., National Board of Fire Underwriters, 76 William St., New York City.	June 16, 1919
DIRATS, JANIK KEVORK. Engr. Mgr., Franco-American Agency, 54 rue Taitbout, Paris, France.	Jun. May 28, 1912 Assoc. M. May 12, 1919

ASSOCIATE MEMBERS (*Continued*)

	Date of Membership.
ELCOCK, CHARLES. 123 Bethlehem Pike, Chestnut Hill, Philadelphia, Pa.	June 16, 1919
EMERSON, CHARLES JOHN. 328 Custom House, San Francisco, Cal.	May 12, 1919
EPSTEIN, ABRAHAM. Structural Engr., 2001 West 39th St. (Res., 6163 South Michigan Ave.), Chicago, Ill.	May 12, 1919
FERVER, ARTHUR LEE. Plant Engr., Southwestern Shipbuilding Co., East San Pedro, Cal.	May 12, 1919
FINESTONE, NATHANIEL. Asst. Engr., Aguila Refinery, Cia. Mex. de Petroleo "El Aguila", S. A., Minatitlan, Mexico	June 16, 1919
FISCHER, ANDREW, JR. 120 Montgomery St., Bloomfield, N. J.	June 16, 1919
FISCHER, WALTER ARTHUR. Hydr. Engr.; Advisory Engr. on Water Supply and Fire Protection, Constr. Div., U. S. A., Room 1-316, Bldg. C, 7th and B Sts., Washington, D. C.	June 16, 1919
FISHER, ALFRED PHILIP. Cons. Engr. (Badt & Fisher), 1016 Nevada Bank Bldg., San Francisco, Cal.	April 14, 1919
FLEMING, PHILIP BRACKEN. Col., Engrs., U. S. A.; Director of Drawing Dept., U. S. Engr. School, Camp A. A. Humphreys, Va.	May 12, 1919
FOLK, CHARLES JAMES. Asst. Engr., Valuation Dept., L. V. R. R., 62 Lewis St., Phillipsburg, N. J.	June 16, 1919
FOLLIN, JAMES WIGHTMAN. Capt., San. C., U. S. A., Office of Surgeon General, 3535 Thirteenth St., N. W., Washington, D. C.	Jun. Oct. 7, 1914 Assoc. M. May 12, 1919
FOX, ROBERT LEE. City Engr., 129 East Broad St., Bethlehem, Pa.	June 16, 1919
FRETZ, EDMOND ANTHONY. Chf. Engr., Horton & Horton, Box 916, Houston, Tex.	Jun. Feb. 4, 1913 Assoc. M. May 12, 1919
GALLAGHER, HERBERT MORGAN. Asst. Engr., So. Ry., Box 830, Meridian, Miss.	June 16, 1919
GARDNER, LEROY ERNEST. Capt., Q. M. C., U. S. A., Fort Ringgold, Tex.	April 14, 1919
GATES, GEORGE WILLIAM. Acting Res. Engr., Eastern Dist., Constr. Dept., N. Y. C. R. R., 382 Wadsworth Ave., New York City	June 16, 1919
GAULT, JOHN JAMES. Pilot Engr., C. & A. R. R., 2920 Sheffield Ave., Chicago, Ill.	Jun. Mar. 2, 1915 Assoc. M. May 12, 1919
GEARHART, ORVAL LEE. 37 Dixon National Bank, Dixon, Ill.	June 16, 1919
GLAESER, FREDERICK. Engr., U. S. Shipping Board, Emergency Fleet Corporation, 38 South Hermitage Ave., Trenton, N. J.	May 12, 1919

ASSOCIATE MEMBERS (*Continued*)

	Date of Membership.
GLAETTLI, JOHN, JR. With U. S. Shipping Board, Emergency Fleet Corporation, Box 1413, San Diego, Cal..	June 16, 1919
GRAHAM, ROLAND RUSSELL. With Am. Bridge Co., 30 Church St., New York City (Res., 28 Carroll St., Yonkers, N. Y.)..... Jun. / Assoc. M.	May 15, 1917 / June 16, 1919
GREEN, GROVER CLEVELAND. Cottonwood, Cal.....	June 16, 1919
GRIFFIN, E. RAY. City Engr.; County Engr.; (Black & Griffin), Mandan, N. Dak.....	June 16, 1919
GUSTIN, LESTER CARLISLE. Pres. and Engr., Boston Structural Steel Co., 241 Albany St., Cambridge, Mass..	May 12, 1919
HAM, ROSCOE CONKLING. Transitman, Park Board Survey Party, 3728 Valentine Rd., Kansas City, Mo.....	June 16, 1919
HANGER, KENNETH HARROW. Care, C., R. I. & P. R. R., El Dorado, Ark.....	June 16, 1919
HANSON, FRED ERNEST. 185 Leete St., West Haven, Conn...	May 12, 1919
HARRIS, FRANK WILLIAM. 905 East 6th St., Olympia, Wash.....	May 12, 1919
HAVENS, HARRY LUCAS. Structural Engr., 400 Graphic Arts Bldg., Kansas City, Mo.....	April 14, 1919
HEARN, RICHARD LANKASTER. Asst. to Hydr. Engr., Hydro-Elec. Power Comm. of Ontario, 229 Havelock St., Toronto, Ont., Canada.....	May 12, 1919
HEIN, PETER LEO. (Lieberman, Klein & Hein), Room 538, State Lake Bldg., Chicago, Ill.....	June 16, 1919
HESSION, JOHN HENRY. Dist. Engr., Corrugated Bar Co., 592 Huron Ave., Cambridge, Mass.....	June 16, 1919
HICKS, PRESTON THOMAS. Cons. Engr.; City Engr. and Engr. to San. Dist. of Decatur, Court House (Res., 119 South Edward St.), Decatur, Ill.....	June 16, 1919
HITCHCOCK, ARTHUR BEERS. Mgr., Paving Dept., The Barrett Co., 325 South Jackson Ave., Kansas City, Mo..	June 16, 1919
HOFF, FRANK WARNE. With Universal Portland Cement Co., 929 Belmont Ave., Youngstown, Ohio.....	June 16, 1919
HOLLISTER, SOLOMON CADY. Designer, Concrete Ship Section, Emergency Fleet Corporation, 4420 Chestnut St., Philadelphia, Pa.....	May 12, 1919
HOPKINS, JOHN THOMAS. Borough Engr., Highland Park (Res., 59 Lincoln Ave., New Brunswick), N. J.....	June 16, 1919
HUGHES, CHARLES WARREN. Asst. City Engr., 2147 Fifth St., Port Arthur, Tex.....	May 12, 1919
HUNTLEY, LEE HARVEY. Res. Engr., Demerara Bauxite Co., Box 214, Georgetown, British Guiana.....	May 12, 1919
HUSSEY, LAWRENCE. 1334 Seventh St., San Diego, Cal....	Jan. 13, 1919
JERVIS, CHARLES MILLER. Civ. Engr., The Cupey Sugar Co., Cupey, Oriente, Cuba.....	Mar 11, 1919

ASSOCIATE MEMBERS (*Continued*)

	Date of Membership
JOHNSON, HAROLD SUCESE. Supt., Dawson Constr. Co., 1026 West Washington St., San Diego, Cal.	May 12, 1919
JOHNSTON, JOHN WALLACE. Promotion Engr., Portland Cement Assoc., 408 Union Trust Bldg., Parkersburg, W. Va.	June 16, 1919
KELLY, PRESCOTT VAIL. 1200 Jones Bldg., Pittsburgh, Pa.	May 12, 1919
KIMBRELL, GEARY. County Highway Engr., and City Engr., Pendleton, Ore.	June 16, 1919
KNISKERN, PHILLIP WHEELER. Capt., Engrs., U. S. A., 4458 Drexel Boulevard, Chicago, Ill.	Jun. Sept. 12, 1916 Assoc. M. June 16, 1919
LAMB, SYDNEY BISHOP. Draftsman, Valuation Dept., Colo. & South. Ry. (Res., 2652 Lafayette St.), Denver, Colo.	Jun. Jan. 7, 1913 Assoc. M. June 16, 1919
LEECH, EDWARD. Care, Art Metal Constr. Co., Jamestown, N. Y.	June 16, 1919
LEVINE, HAROLD JULIUS. Cons. and Industrial Engr. (Kaufman & Levine), 21 East 40th St., New York City.	May 12, 1919
LIDDELL, NATHANIEL MORRIS. Engr. in Chg. of Road Constr., Care, County Engr., Court House, Topeka, Kans. (Res., 508 West Harrison St., Danville. Ill.)	June 16, 1919
LOCKWOOD, REX BARNUM. Chf. Engr., Atlantic, Gulf & Pacific Co. of Manila, Box 626, Manila, Philippine Islands.	April 14, 1919
LOMAX, NELSON JOHNSON. Res. Engr., Waddell & Son, 800 Graphic Arts Bldg., Kansas City, Mo.	June 16, 1919
MCHENRY, REYNOLDS. Engr., Leland S. Rosener, 2975 Pacific Ave., San Francisco, Cal.	Mar. 11, 1919
MANDELL, SOLON BARON. With the Submarine Boat Corporation, 1 West 85th St., New York City.	May 12, 1919
MARDEN, LESLIE ONA. Chf. Draftsman, North Dakota State Highway Comm., 615 Second St., Bismarck, N. Dak.	Mar. 11, 1919
MARKHART, CLARK ORROMELL. 1319 Fulton Bldg., Pittsburgh, Pa.	Jan. 13, 1919
MARSHALL, LESLIE STANCLIFFE. Chf. of Party, Emergency Fleet Corporation, 525 Collings Ave., West Collingswood, N. J.	May 12, 1919
MILLER, DEMONT GEORGE. Sales Mgr., Layne & Bowler Corporation, 900 Santa Fe Ave., Los Angeles, Cal.	June 16, 1919
MULLINS, JOE BURROW. Civ. and Area Engr., Dupont Eng. Co., Flint, Mich.	May 12, 1919

ASSOCIATE MEMBERS (*Continued*)

	Date of Membership.
MULLINS, THOMAS CLINTON. Capt., Engrs., U. S. A., Co. C, 34th Engrs., Am. Exp. Forces, France; Address, Boonville, Ind.	Jan. 13, 1919
MYERS, PATRICK HENRY. Chf. Engr. and Railroad Supt., Cuyamel Fruit Co., Cuyamel, Spanish Honduras, *via* New Orleans, La.	May 12, 1919
NASH, JAMES PHILIP. Office Engr., Texas State Highway Dept. (Res., 1501 Colorado St.), Austin, Tex.	Mar. 11, 1919
NIGHSWONGER, HARRISON WORTH. 13th Floor, Colcord Bldg., Oklahoma, Okla.	May 12, 1919
OAKES, BETHUEL SUTHERLAND. Superv. Plant Engr., U. S. Shipping Board, Emergency Fleet Corporation, Box 561, Wilmington, N. C.	May 12, 1919
O'CONNOR, FRANCIS BARNARD. Asst. Chf. Engr., Alphons Custodis Chimney Constr. Co., 95 Nassau St. (Res. 1 Lexington Ave.), New York City.	June 16, 1919
ORR, SCOTT WESLEY. Designing Engr., Fay, Spofford & Thorndike, 58 County Rd., Chelsea, Mass.	June 16, 1919
OTTO, OLAF. Civ. Engr. and Contr., 301 Savannah Bank & Trust Bldg., Savannah, Ga.	June 16, 1919
PATTERSON, CHARLES ARTHUR. Borough Engr., City Hall Bldg., Torrington, Conn.	June 16, 1919
RIDLEY, CLARENCE EUGENE. City Engr., City Hall, Port Arthur, Tex.	May 12, 1919
ROSE, ALEXANDER. Structural Engr., 632 Builders Exchange, Minneapolis, Minn.	Nov. 26, 1918
RYAN, JAMES TILLMAN. Valuation Engr., Pacific Gas & Elec. Co., 445 Sutter St., San Fransisco, Cal.	May 12, 1919
SAVILLE, THORNDIKE. Associate Prof. of San. Eng., Univ. of North Carolina, Chapel Hill, N. C.	May 12, 1919
SEABROOK, HUGH RAYNER. Royal Societies Club, 63 St. James St., London, S. W., England.	June 16, 1919
SHANK, JACOB RALPH. Asst. Prof., Civ. Eng., The Ohio State Univ., 97 West Tompkins St., Columbus, Ohio.	June 16, 1919
SHEA, WILLIAM JAMES. Maj., Engrs., U. S. A., 1515 Sixteenth St., N. W., Washington, D. C.	May 12, 1919
SINCLAIR, LEONARD HANSCOME. Asst. Project Mgr., U. S. Navy Dept., Room 2916, Navy Bldg., Washington, D. C.	Jun. Oct. 1, 1913 Assoc. M. May 12, 1919
SORZANO, CARLOS TEJADA. Casilla 276, La Paz, Bolivia.	May 12, 1919
STANFIELD, ADRIAN CLYDE. Pana, Ill.	June 16, 1919
STAPE, GEORGE PHILIP ALEXANDER. Planning Engr., The Dayton Wright Airplane Co., Research Div., 127 North Ludlow St., Dayton, Ohio.	April 14, 1919

ASSOCIATE MEMBERS (*Continued*)

	Date of Membership.
STEARNS, FRED LEROY. 173 Hicks St., Brooklyn, N. Y. — Jun.	April 2, 1912
— Assoc. M.	May 12, 1919
STEIN, BENJAMIN. Engr., Hennebique Const. Co., 5 Elizabeth Court, Beach 40th St., Edgemere, N. Y.	June 16, 1919
STRACHAN, JOSEPH JOSLIN. Lieut., C. E. C., U. S. N., U. S. Navy Yard, Boston, Mass. — Jun.	April 7, 1915
— Assoc. M.	May 12, 1919
TALBOT, LYMAN ROBERT. 1811 Ross St., Sioux City Iowa	May 12, 1919
TAYLOR, MARCUS PREVOST. Capt., Engrs., U. S. A., Care, Dept. Engr., Fort Sam Houston, San Antonio, Tex.	May 12, 1919
TILTON, GEORGE ALBERT, JR. Res. Engr., California Highway Comm., 1703 Chorro St., San Luis Obispo, Cal. — Jun.	Sept. 12, 1916
— Assoc. M.	June 16, 1919
TRASK, WARREN DUDLEY. Asst. Div. Engr., Fay, Spofford & Thorndike, 22 Bartlett St., Somerville, Mass.	Mar. 11, 1919
TYLER, JAMES. Asst. City Engr., Town Hall, Auckland, New Zealand	Mar. 11, 1919
TYNDALL, ARTHUR. Care, Public Works Dept., Wellington, New Zealand	Mar. 11, 1919
WALLIS, RICHARD PARKER. Engr., Frank E. Wallis & Son, 56 West 45th St., New York City	June 16, 1919
WALTER, LLOYD DEWITT. Bee Bldg., Omaha, Nebr	June 16, 1919
WARE, SAMUEL HOUSTON. Capt., Engrs., U. S. A., Camp A. A. Humphreys, Va	May 12, 1919
WENSTRAND, RALPH THEODORE. Contr., Western Bridge & Constr. Co., 648 Bee Bldg., Omaha, Nebr	June 16, 1919
WEST, FRANK HUBBLE. Care, Hawaiian Contr. Co., Ltd., Hilo, Hawaii	May 12, 1919
WILLIAMS, TIMOTHY SILAS. Asst. to Concrete Engr., Westinghouse, Church, Kerr & Co., 37 Wall St., Room 912, New York City	June 16, 1919
WINSHIP, LEF. Asst. to Chf. Engr., Mo. Pac. R. R., 4138 Cleveland Ave., St. Louis, Mo	June 16, 1919
WISLER, CHESTER OWEN. Camp Davis, Topinabee, Mich.	April 14, 1919
WITTE, HERMAN CALVERT. Structural Engr., Concrete Ship Dept., Emergency Fleet Corporation, 3733 Locust St., Philadelphia, Pa	May 12, 1919
WOLFE, WILLIAM SIDNEY. Structural Engr., Smith, Hinchman & Grylls, Washington Arcade, Detroit, Mich.	May 12, 1919
WONG, JICK GAM. Res. Engr., Sections 7 and 10, Hankow-Ichang Ry., Han-I Ry. Office, Tsaoshih, Hupeh Prov., China — Jun.	Oct. 7, 1914
— Assoc. M.	Mar. 11, 1919
WOOD, CLYDE WARREN. Asst. Engr., South San Joaquin Irrig. Dist., Manteca, Cal	June 16, 1919
ZEHR, VRATISLAV ADOLPH. Cons. Engr., E. T. Perkins Eng. Co., Box 119, Pekin, Ill	June 16, 1919

ASSOCIATES

	Date of Membership.
CARPENTER, FORD ASHMAN. Meteorologist, U. S. Weather Bureau, Los Angeles, Cal	June 16, 1919
IRWIN, WILLIAM CLARK. Sales Engr., Railroad and Contractors' Supplies, 603 Frisco Bldg., St. Louis, Mo.	June 16, 1919
WALKER, FRANK RABOLD. Bldg. Contr. (Frank R. Walker Co.), 168 North Michigan Ave., Chicago, Ill	June 16, 1919

JUNIORS

BAYER, HARRY LEWIS. With H. S. Ferguson, Temiskaming, Que., Canada	June 16, 1919
BROCKWAY, WARNER COTTON. 2d Lieut., San. C., U. S. A.; Camp San. Engr., Camp Bragg, N. C	April 14, 1919
BURKE, MICHAEL JOSEPH. 1301 Charleston St., Mattoon, Ill	June 16, 1919
CAMLIN, WILLIAM JOHN. Care, Minnesota Highway Dept., St. Paul, Minn	May 12, 1919
DIAS, MOACYR RODRIGUES. 20 Rua Sabara, São, Paulo, Brazil	Mar. 11, 1919
FOSTER, JAMES APKER. Junior Highway Engr., State of Illinois, 302 Apollo Theatre Bldg., Peoria, Ill	May 12, 1919
GRIFFITH, JAMES RINALDO. 619½ West Howard St., Muncie, Ind	May 12, 1919
GRUPE, EDGAR YOUNG, JR. Aeronautical Engr., Eng. Dept., U. S. A., Fort Omaha, Nebr	April 14, 1919
GUEST, JOHN HENRY. City Hall, Pine Bluff, Ark	April 14, 1919
HARN, JOHN EDWIN. 2314 Oak St., Baltimore, Md	May 12, 1919
HEYWOOD, GENE BRYANT. Care, Southern California Edison Co., Kernville, Cal	June 16, 1919
KANE, WALLACE BYRNE. 212 Frisco Bldg., Joplin, Mo	May 12, 1919
KUCHAR, JOSEPH JAROMIR. Asst. Engr. to Res. Engr., J. G. White Eng. Corporation, Muscle Shoals, Ala	June 16, 1919
LUHRS, ALBERT WEIGAND. Transitman, M. of W. Dept., Erie R. R., 150 North St., Jersey City, N. J	May 12, 1919
MCSWEENEY, THOMAS FRANCIS. 1 Salem End Rd., Framingham, Mass	May 12, 1919
MIAO, EN-CHAO. Care, K. S. Yuen, Box 835, U. S. Postal Agency, Shanghai, China	May 12, 1919
ROBERTSON, LOUIS WELLINGTON. 2d Lieut., Engrs., U. S. A., Box 85, El Paso, Tex	May 12, 1919
SOPP, CLAUDE WELLINGTON. Junior Engr., U. S. Geological Survey, Box 519, Pasadena, Cal	June 16, 1919
THOMPSON, MISSAC. Reinforced Concrete Engr., 640 Broadway, New York City	June 16, 1919
TRIANA, JORGE. Ingeniero Jefe, Ferrocarril del Tolima, Box No. 5, Bogota, Colombia	Mar. 11, 1919

JUNIORS (*Continued*)

	Date of Membership.
VICKERS, PAUL AMOS. 3028 Harrison St., Kansas City, Mo.	June 16, 1919
WEISKOPF, EDWARD FRANCIS. 11 East 42d St., New York City	April 14, 1919
WELLS, CLIFTON KENNADY, JR. Contr. and Builder (Constable-Wells Co.), 2919 Guilford Ave., Baltimore, Md.	May 12, 1919

REINSTATEMENTS

MEMBERS

	Date of Reinstatement.
SPOONER, HERMAN WINSLOW	June 16, 1919

RESIGNATIONS

ASSOCIATE MEMBERS

	Date of Resignation.
HARMON, WATSON GILBERT	June 16, 1919

JUNIORS

HALLBERG, ARTHUR SIDNEY	June 16, 1919
YOUNGLING, LOUIS SHEMALD	June 16, 1919

DEATHS

ALLEN, HERMON CHARLES. Elected Member, May 2d, 1911; died May 4th, 1919.

CHASE, DEAN. Elected Junior, June 3d, 1915; died May 26th, 1919.

DOBSON, ADNA. Elected Member, May 6th, 1908; died May 4th, 1919.

FORD, WILLIAM GRIFFING. Elected Member, October 5th, 1904; died June 23d, 1919.

HARDY, HARRY. Elected Associate Member, June 1st, 1892; Member, June 1st, 1909; died April 4th, 1919.

HAVILAND, ARTHUR. Elected Junior, January 4th, 1882; Member, January 4th, 1888; died June 18th, 1919.

HENDRIE, JOHN GIBSON. Elected Junior, September 5th, 1911; Associate Member, April 2d, 1913; Member, May 12th, 1919; died June 18th, 1919.

HENLEY, ROBERT DWIGGINS MONTEITH. Elected Junior, September 3d, 1901; Associate Member, January 31st, 1911; died May 3d, 1918.

NICHOLS, ALLEN EUGENE. Elected Associate Member, October 10th, 1916; died May 8th, 1919.

OWENS, HENRY KINDER. Elected Member, March 6th, 1889; died May 15th, 1919.

PETHERAM, GEORGE THOMAS. Elected Associate Member, February 28th, 1911; died October, 1918.

RITTER, HOMER PETER. Elected Member, November 3d, 1915; died April 21st, 1919.

SAUERMAN, HENRY BURGER. Elected Associate Member, May 1st, 1907; Member, May 31st, 1916; died May 20th, 1919.

SCHUSSLER, HERMANN FREDERICK AUGUST. Elected Member, February 4th, 1914; died April 27th, 1919.

SHIRAISHA, NAOJI. Elected Member, October 4th, 1899; died February 17th, 1919.

SPEIDEL, HUGO S. Elected Junior, February 5th, 1890; died June 17th, 1919.

STEPHENS, GEORGE HIPPESLEY STANLEY. Elected Associate Member, December 5th, 1911; died December 13th, 1918.

STIMSON, BURT. Elected Associate Member, September 12th, 1916; died May 26th, 1919.

SWENSSON, EMIL. Elected Member, June 7th, 1893; died May 13th, 1919.

TORRALBAS, RAFAEL JOAQUIN. Elected Junior, November 1st, 1910; Associate Member, June 24th, 1914; died September 25th, 1918.

UHLIG, CARL. Elected Member, October 7th, 1903; died May 5th, 1919.

WHITE, JOHN WESLEY. Elected Junior, April 14th, 1919; died June 2d, 1919.

Total Membership of the Society, August 8th, 1919, 9 190.

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST

(May 1st to July 17th, 1919)

NOTE.—*This list is published for the purpose of placing before the members of this Society, the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.*

LIST OF PUBLICATIONS

In the subjoined list of articles, references are given by the number prefixed to each journal in this list:

(2) *Journal,* Engrs. Club of Phila., Philadelphia, Pa.
(3) *Journal,* Franklin Inst., Philadelphia, Pa., 50c.
(4) *Journal,* Western Soc. of Engrs., Chicago, Ill., 50c.
(5) *Journal,* Eng. Inst. of Canada, Montreal, Que.
(6) *Journal,* Am. Inst. of Archts., Washington, D. C., 50c.
(7) *Gesundheits Ingenieur,* Munich, Germany.
(8) *Stevens Indicator,* Hoboken, N. J., 50c.
(9) *Industrial Management,* New York City, 25c.
(11) *Engineering* (London), W. H. Wiley, 432 Fourth Ave., New York City, 25c.
(12) *The Engineer* (London), International News Co., New York City, 35c.
(13) *Engineering News-Record,* New York City, 15c.
(15) *Railway Age,* New York City, 15c.
(16) *Engineering and Mining Journal,* New York City, 15c.
(17) *Electric Railway Journal,* New York City, 10c.
(18) *Railway Review,* Chicago, Ill., 15c.
(19) *Scientific American Supplement,* New York City, 10c.
(20) *Iron Age,* New York City, 20c.
(21) *Railway Engineer,* London, England, 1s. 2d.
(22) *Iron and Coal Trades Review,* London, England, 6d.
(24) *American Gas Engineering Journal,* New York City, 10c.
(25) *Railway Mechanical Engineer,* New York City, 20c.
(26) *Electrical Review,* London, England, 4d.
(27) *Electrical World,* New York City, 10c.
(28) *Journal,* New England Water-Works Assoc., Boston, Mass., $1.
(29) *Journal,* Royal Soc. of Arts, London, England, 6d.
(32) *Mémoires et Compte Rendu des Travaux,* Soc. Ing. Civ. de France, Paris, France.
(33) *Le Génie Civil,* Paris, France, 1 fr.
(36) *Cornell Civil Engineer,* Ithaca, N. Y.
(40) *Zentralblatt der Bauverwaltung,* Berlin, Germany, 60 pfg.
(41) *Elektrotechnische Zeitschrift,* Berlin, Germany.
(42) *Proceedings,* Am. Inst. Elec. Engrs., New York City, $1.
(43) *Annales des Ponts et Chaussées,* Paris, France.
(45) *Coal Age,* New York City, 10c.
(46) *Scientific American,* New York City, 15c.
(47) *Mechanical Engineer,* Manchester, England, 3d.
(49) *Zeitschrift für Bauwesen,* Berlin, Germany.
(53) *Zeitschrift,* Oesterreichischer Ingenieur und Architekten-Verein, Vienna, Austria, 70h.
(54) *Transactions,* Am. Soc. C. E., New York City, $16.
(55) *Mechanical Engineering*: Journal Am. Soc. M. E., New York City, $10.
(56) *Transactions,* Am. Inst. Min. and Metallurgical Engrs., New York City, $6.
(57) *Colliery Guardian,* London, England, 5d.
(58) *Proceedings,* Engrs.' Soc. of W. Pa., 2511 Oliver Bldg., Pittsburgh, Pa., 50c.
(59) *Proceedings,* American Water Works Assoc., Troy, N. Y.
(60) *Municipal and County Engineering,* Indianapolis, Ind., 25c.
(61) *Proceedings,* Western Railway Club, 225 Dearborn St., Chicago, Ill., 25c.
(62) *American Drop Forger,* Thaw Bldg., Pittsburgh, Pa., 10c.
(63) *Minutes of Proceedings,* Inst. C. E., London, England.
(64) *Power,* New York City, 10c.
(65) *Official Proceedings,* New York Railroad Club, Brooklyn, N. Y., 15c.
(66) *Gas Journal,* London, England, 6d.
(67) *Cement and Engineering News,* Chicago, Ill., 25c.
(71) *Journal,* Iron and Steel Inst., London, England.
(71a) *Carnegie Scholarship Memoirs,* Iron and Steel Inst., London, England.
(72) *American Machinist,* New York City, 15c.
(73) *Electrician,* London, England, 18c.
(74) *Transactions,* Inst. of Min. and Metal., London, England.

(75) *Proceedings*, Inst. of Mech. Engrs., London, England.
(77) *Journal*, Inst. Elec. Engrs., London, England, 5s.
(78) *Beton und Eisen*, Vienna, Austria, 1, 50m.
(83) *Gas Age*, New York City, 15c.
(85) *Proceedings*, Am. Ry. Eng. Assoc., Chicago, Ill.
(86) *Engineering and Contracting*, Chicago, Ill., 10c.
(87) *Railway Maintenance Engineer*, Chicago, Ill., 10c.
(89) *Proceedings*, Am. Soc. for Testing Materials, Philadelphia, Pa., $5.
(90) *Transactions*, Inst. of Naval Archts., London, England.
(91) *Transactions*, Soc. of Naval Archts. and Marine Engrs., New York City.
(92) *Bulletin*, Soc. d'Encouragement pour l'Industrie Nationale, Paris, France.
(93) *Revue de Métallurgie*, Paris, France, 4 fr. 50.
(96) *Canadian Engineer*, Toronto, Ont., Canada, 10c.
(98) *Journal*, Engrs. Soc. of Pa., Harrisburg, Pa., 30c.
(99) *Proceedings*, Am. Soc. of Municipal Improvements, New York City, $2.
(100) *Professional Memoirs*, Corps of Engrs., U. S. A., Washington, D. C., 50c.
(101) *Metal Worker*, New York City, 10c.
(103) *Mining and Scientific Press*, San Francisco, Cal., 10c.
(104) *The Surveyor and Municipal and County Engineer*, London, England, 6d.
(105) *Chemical and Metallurgical Engineering*, New York City, 25c.
(106) *Transactions*, Inst. of Min. Engrs., London, England, 6s.
(107) *Schweizerische Bauzeitung*, Zürich, Switzerland.
(109) *Journal*, Boston Soc. C. E., Boston, Mass., 50c.
(110) *Journal*, Am. Concrete Inst., Philadelphia, Pa., 50c.
(111) *Journal of Electricity*, San Francisco, Cal., 25c.
(113) *Proceedings*, Am. Wood Preservers' Assoc., Baltimore, Md.
(114) *Journal*, Institution of Municipal and County Engineers, London, England, 1s. 6d.
(115) *Journal*, Engrs.' Club of St. Louis, St. Louis, Mo., 35c.
(116) *Blast Furnace and Steel Plant*, Pittsburgh, Pa., 15c.
(117) *Engineering World*, Chicago, Ill.
(118) *Times Engineering Supplement*, London, England, 2d.
(119) *Landscape Architecture*, Harrisburg, Pa., 50c.
(120) *Automotive Industries*, New York City, 15c.

LIST OF ARTICLES

Bridges.

The Coblenz Pontoon Bridge.* J. W. Skelly. (100) Mar.
Filling Trestles on the Southern Pacific. W. E. Burns. (87) May.
Recommended Procedure in the Painting and Maintenance of Highway Bridges. Charles D. Snead. (Paper read before Univ. of Kentucky Road School.) (60) May.
Studying the Defects in Masonry Structures.* (87) May.
Raising Allegheny River Bridge 13 Ft. by Jacking.* (13) May 1.
Reinforcement of Bridge by Means of an Eccentric Chord.* (13) May 8.
A Survey of Electric Railway Bridge Maintenance.* R. C. Cram. (17) May 17.
Design of New Superstructure of Louisville Bridge with 644-Ft. Riveted Span.* (13) May 22.
Pneumatic Caissons with Wooden Cylinders for Sinking Bridge Piers.* (86) May 28.
Maintaining Traffic During Erection of Louisville Bridge.* (13) May 29.
The Replacement of the Delaware River Bridge.* (Philadelphia, Pa.) Warren P. Laird. (2) June.
Concrete in Roads, Bridges and Culverts.* H. Eltinge Breed. (Paper read before Canadian Good Roads Congress.) (60) June.
Reinforced Concrete Bridges and Their Architectural Treatment.* F. G. Engholm. (67) June.
Tests to Free Under Side of Railroad Viaducts from Smoke. (13) June 12.
Yielding Barriers Close Roads at Drawbridges.* (13) June 12.
Lighting and Control for Bridge Over the Columbia.* F. H. Murphy. (27) June 14.
Construction of New Arch Section of Galveston Causeway.* (13) June 19.
Rebuilding the Genesee River Bridge, Lehigh Valley R. R., at Wadsworth, N. Y. (18) June 21.
Points Requiring Special Observation and Investigation in Bridge Inspection. Herbert C. Keith. (From paper read before Brooklyn Engrs. Club.) (86) June 25.
Railway Bridge Design: Loadings and Actual Engine Loads.* B. R. Leffler. (13) June 26.
How an Old Masonry Arch Bridge Was Rebuilt.* (87) July.
The Bloor Street Viaduct, Toronto, Ontario.* Thomas Taylor. (5) July.

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Bridges—(Continued).

Problems Encountered in the Design of 12th Street Bridge.* (Chicago, Ill.) Hugh E. Young. (117) July 1.
Comparison of Five Railway Bridge Specifications.* (13) July 3.
Special Design Features and Erection Methods for 540-Ft. Suspension Bridge.* William G. Grove. (13) July 3.
American Engineers Make Records in Bridging the Rhine.* James M. Farrin and Sam H. Andrews. (13) July 17.
Bac-Transbordeur et Pont Tournant pour la Traversée du Canal Maritime de Suez à Kantara.* Jean Raimondi. (33) Mar. 15.
Les Ponts-Routes Militaires de l'Armée Anglaise.* R. Méchin. (33) Apr. 12.
Die Vollendung der Brücke über den St. Lorenzstorm bei Quebec. Wernekke. (40) Jan. 29.
Neubau der Strassenbrücke über die Klodnitz im Zuge der Wilhelmstrasse in Gleiwitz i Oberschlesien.* Borchard. (40) Feb. 8.
Neue Bauarten zerlegbarer Brücken.* Rudolf Bernhard. (40) Feb. 15.
Die Schwebefähre in Bordeaux.* A. Walther. (107) Apr. 12.
Zur Frage der Zulässigen Spannungen in Beton-Brückengewolben.* A. O. Lusser. (107) May 3.

Electrical.

The Development of Anti-Aircraft Searchlights.* James B. Cress. (100) Mar.
The Determination of the Efficiency of the Turbo-Alternator.* S. F. Barclay and S. P. Smith. (77) Apr.
Voltage Regulation.* J. Humphrey. (22) Apr. 18.
Distribution of Heat, Light and Motive Power by Gas and Electricity. Dugald Clerk. (29) Apr. 18.
The Electrical Features of Hog Island Shipyard.* H. W. Osgood. (Paper read before Assoc. of Iron and Steel Elec. Engrs.) (2) May.
The Susceptibility of Feebly Magnetic Materials.* Ernest Wilson. (77) May.
Utilizing the Time Characteristics of Alternating Current. Henry E. Warren. (42) May.
Transatlantic Radio Reception.* Charles A. Culver. (3) May.
On the Determination of the Electrical and Acoustic Characteristics of Telephone Receivers.* Louis V. King. (3) May.
Lighting of San Francisco's Triangle District.* A. F. Dickerson. (111) May 1.
Sparking Power of Magnetos.* Harry F. Geist. (120) May 1.
Outdoor Substations for Intercounty Development.* (27) May 3.
The Proper Loading of Distribution Transformers. Frank A. Robbins. (Paper read before Wisconsin Elec. Assoc.) (27) May 3.
Rewinding 12 000-Kw. Turbo-Generator Field.* (27) May 3.
Interborough Commissions 60 000-Kw. Turbo-Generator Unit.* W. S. Finlay, Jr. (17) May 10; (27) May 10.
Electric Service in World's Largest Hotel.* (27) Serial beginning May 10.
The Continuous-Rated Motor and Its Application. L. F. Adams. (27) May 10; (19) June 21.
Electric and Elevator Equipment of the Hotel Pennsylvania.* Chas. E. Knox. (64) May 13.
Leaks and Wastes in State Institutions. F. J. McCullough. (64) May 13.
Electrical Precipitation of Solids from Flue Gases.* J. M. Wauchope. (117) May 15.
Direct Current *vs.* Power Factor.* F. E. Austin. (19) May 17.
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Power Installation at the Old Hickory Powder Plant near Nashville, Tennessee.* (64) May 20.
The Electrical Equipment of the U. S. S. *New Mexico.** (From *General Electric Review.*) (26) May 23.
The Running of Mercury Rectifiers in Parallel.* Bela Schäfer. (Abstract of article in *Elektrotechnische Zeitschrift.*) (73) May 23.
Underground Construction and Electrolysis. (Extract from Report of Committee read before N. E. L. A.) (27) May 24.
Theory of the Aron Meter: A Note on the Effect of Impulsive Forces on Pendulums. H. G. Rowledge. (73) May 30.
The Electrical Equipment of H. M. Factory, Gretna.* A. S. Croso. (26) Serial beginning May 30.
Cost Comparison of Transformer Types.* B. C. Dennison. (27) May 31.
Features of Mammoth Waterwheel Generator.* (27) May 31.
The Dielectric Field in an Electric Power Cable.* R. W. Atkinson. (42) June.
Problems of 220-Kw. Power Transmission.* A. E. Silver. (42) June.
An Application of the Radiometer to the Measurement of Electric Current.* Thomas D. Cope. (3) June.
Tree Telephony and Telegraphy.* George O. Squier. (3) June.

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Transmission Line Relay Protection.* H. R. Woodrow and others. (42) June.
Grounding the Neutral of Generating and Transmission Systems.* H. R. Woodrow. (42) June.
The Effect of Transient Voltages on Dielectrics, II.* F. W. Peek, Jr. (42) June.
High-Tension Single-Conductor Cable for Polyphase Systems.* W. S. Clark and G. B. Shanklin. (42) June.
Air Fans for Driving Generators on Airplanes.* G. Francis Gray and others. (55) June.
Power Factor and Phase Rotation.* Leslie F. Curtis. (111) June 1.
Mercury Arc Tube Operation.* R. W. Kidd. (111) June 1.
Pulling Conductors into Conduits.* Terrell Croft. (64) June 3.
Know Your Battery Better. J. H. Tracy. (Paper read before Illinois Min. Inst.) (45) June 5.
Wireless Telephony and Direction Finding.* (12) June 6.
Hysteresis and Eddy-Current Losses in Iron at Radio Frequencies.* Christian Nusbaum. (Abstract of paper read before Am. Inst. of Radio Engrs.) (73) June 6.
A Method of Calibrating Meters.* H. Gewecke and W. Von Krukowski. (From *Elektrotechnische Zeitschrift.*) (73) June 6.
Electric Propulsion for the U. S. S. *New Mexico.** C. S. Raymond. (From *General Electric Review.*) (19) Serial beginning June 7.
Car Dumpers.* James A. Jackson. (From *General Electric Review.*) (16) June 7.
External-Anode Vacuum Tube.* H. P. Donle. (27) June 7.
Improvements in Industrial Plant Operation.* E. E. George. (27) June 7.
The Construction of 120- and 240-Volt Electromagnets and Solenoids.* Henry W. Townsend. (64) June 10.
Calculating Induction-Motor Magnetizing Current.* C. M. Laffoon. (27) June 14.
Rehabilitation of New York Cotton Mill.* (27) June 14.
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Experiences with Electrolytic Arresters.* (27) June 14.
Influence of the Magnetic Field on the Initial Phase of the Electric Discharge. Auguste Righi. (From *Annales de Physique.*) (19) June 14.
Heating of Buildings by Electricity.* V. H. Greisser. (Report read before Idaho Public Utilities Comm.) (111) June 15.
Experience with Electric Heating in the Northwest.* J. D. Ross. (Report read before Idaho Public Utilities Comm.) (111) June 15.
A Simple Method of Determining Power-Factor Correction.* Ralph Kelly. (64) June 17.
A 3 000-H. P. Mill Motor by the G. E. C.* (73) June 20.
Station Load and Economy.* Ths. Norberg Schulz. (73) June 20.
Insuring Durability of the Pole-Top Fittings.* Charles R. Harte. (17) June 21.
How Spacing and Thickness of Brushes Affect Commutation.* Warren C. Kolb. (64) June 24.
Electricity Supply at Shanghai.* T. H. U. Aldridge. (26) June 27.
The Practicability of Transmission Lines at Highest Voltages in this Country.* G. U. Twiss. (73) June 27.
Aluminium Conductors for Overhead Power Transmission Lines.* Arthur Jacob. (73) June 27.
The New Power Station at Rotherham.* (73) Serial beginning June 27.
A Rectangular-Component Two-Dimensional Alternating-Current Potentiometer.* A. E. Kennelly and Edy Velander. (3) July.
High Frequency Currents on Wires. J. O. Mauborgne. (3) July.
Industrial Lighting.* C. E. Clewell. (Paper read before the Illuminating Eng. Soc.) (3) July.
The Absolute Measurement of the Intensity of Sound.* Arthur Gordon Webster. (42) July.
Notes on Suspension Insulator Design.* H. L. Garbutt. (111) July 1.
Single-Phase Load on a Two-Phase System.* J. B. Gibbs. (64) July 1.
Acquired Radio-Activity. William Crookes. (From *Philos. Trans.*, Royal Soc., and *Chemical News.*) (19) Serial beginning July 5.
Rapid Testing of Magnetic Materials.* Thomas Spooner. (27) July 5.
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Current Distribution in Armature Conductors.* Waldo V. Lyon. (27) July 12.
Northwest Pennsylvania's Newest Station.* J. B. Scott. (27) July 12.
Standardized Industrial Lighting Systems.* W. L. Cornelison. (27) July 12.
Factors in Obtaining Maximum Output from Hydro-Electric Plants. Fred A. Abner. (From the 1919 Report, Prime Movers Committee, National Elec. Light Assoc.) (64) July 15.
Reverse-Current Relays—Principles of Operation.* Victor W. Todd. (64) July 15.

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La Station Centrale Thermo-Electrique de Västeras (Suède).* (33) Apr. 12.
Nouvelles Installations dans les Grandes Stations Centrales des Etats-Unis; Groupes Turbo-Moteurs à Vapeur de 50 000 et 60 000 Kilowatt.* (33) May 24.
Connexions à la Terre des Systèmes de Distribution Electrique. (33) May 31.
Formeln für die Grosse elecktrischer Maschinen. L. Klein. (41) Jan. 2.
Die Begrenzung des Erdschlussstromes und die Unterdrückung des Erdschluss Lichtbogens durch die Erdschlusspule.* W. Petersen. (41) Serial beginning Jan. 2.
Beitrag zur Entwicklung des Fernsprech-Nebenstellenwesens. Franz Hendrichs. (41) Jan. 2.
Ueber die Grenzen der Kraftübertragung durch Wechselstrome. M. Dolivo-Dobrowolsky. (41) Jan. 2.
Unterirdische und oberirdische Wechselstrom-Höchstleistungskabel.* W. Kummer. (107) May 10.

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The U. S. Electrically-Propelled Battleship *New Mexico.* S. M. Robinson. (11) Apr. 25.
The Electrical Features of Hog Island Shipyard.* H. W. Osgood. (Paper read before Assoc. of Iron and Steel Elec. Engrs.) (2) May.
The Navigational Magnetic Compass Considered as an Instrument of Precision.* M. B. Field. (77) May.
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Water-Tube Boilers for Cargo Ships. (12) May 16.
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The Electrical Equipment of the U. S. S. *New Mexico.** (From *General Electric Review.*) (26) May 23.
Design and Construction of Flying-Boats.* David Nicholson. (Paper read before Inst. of Engrs. and Shipbuilders in Scotland.) (11) May 23.
Westinghouse-Rateau Marine Geared Turbine Installation.* (11) May 23.
Design and Construction of Navy Concrete Oil Barges.* R. M. Burkhalter. (13) May 29.
Turbine-Driven Pipeless Salvage Bilge Pumps.* (11) May 30.
Underwater Construction of Outshore Launching Ways.* E. D. Buel. (13) June 5.
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America Flies the Atlantic: The Design and Development of the N.C.-4.* (46) June 7.
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Carron Dry Dock at Grangemouth.* (11) June 13.
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British Concrete Shipbuilding: Unit System Construction.* W. Noble Twelvetrees. (11) June 27.
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Crude-Oil Motors *vs.* Steam Engines in Marine Practice.* J. W. Morton. (55) July.
Shipbuilding Equipment and Methods at Fore River: I, Hull Construction Plant. (13) July 3.
Fabricated-Ship Plant Planned for Later General Use.* M. E. Allen. (13) July 10.
Bunkering Big Ships.* J. F. Springer. (46) July 12.
Les Ferry-Boats Militaires Franco-Anglais.* (33) Feb. 22.
Les Appareils de Levage dans les Chantiers de Constructions Navales.* (33) Apr. 5.
Mécanismes Amovibles pour la Propulsion des Navires.* Tayon. (33) Apr. 19.
Motorsegler aus Beton.* (78) Feb. 5.

Mechanical.

The Utilization of Waste Heat from Open-Hearth Furnaces for the Generation of Steam.* Thomas B. Mackenzie. (71) Vol. 98, 1918.
The Standardization of Tests for Refractory Materials.* (Report of Committee of Ceramic Soc.) (71) Vol. 98, 1918.
Automobile Power Plant. G. F. Kettering. (4) Jan.
The Practical Operation of Industrial Boilers. W. E. Snyder. (58) Mar.
A Modern Coke Oven and By-Product Plant.* Drummond Paton. (Paper read before Manchester Geological and Min. Soc.) (57) Apr. 17.
The Dynamical Balance of Recoiling Parts in Heavy Gun Carriages.* G. M. Russell. (11) Apr. 18.

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Mechanical

* Illustrated.

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Distribution of Heat, Light and Motive Power by Gas and Electricity. Dugald Clerk. (29) Apr. 18.

Determining Correct Location of Brake Levers.* Walter C. Baker. (From paper read before Soc. of Automotive Engrs.) (120) Apr. 24.

Fordson Tractor Assembly Wholly on Progressive Plan.* J. Edward Schipper. (120) Serial beginning Apr. 24.

King-Bugotti 16-Cylinder Aero Engine.* (120) Serial beginning Apr. 24.

Some Features of Carbonization and Bye-Product Recovery. J. Thorp. (Paper read before Coke-Oven Managers' Assoc.) (66) Apr. 29; (57) May 2.

An Exhaust Steam Turbine Installation.* R. M. Rush. (62) Serial beginning May; (62) June.

A Review of Modern Steam Shovel Practice, with Recommended Procedure.* Llewellyn N. Edwards. (60) May.

Proper Lubrication of Air Compressors.* H. V. Conrad. (Paper read before Compressed Air Soc.) (116) May.

Combustion Considerations of Solid Fuel.* A. D. Williams. (116) May.

G.-L. Low-Temperature Carbonizing Process.* (45) May 1.

New Coke Ovens at the Providence Gas Works.* Edward H. Bauer. (83) Serial beginning May 1.

Steel Works Machinery.* T. W. Hand. (Paper read before Sheffield Soc. of Engrs. and Metallurgists.) (11) Serial beginning May 2.

Air Mileage of Aeroplanes Intended for Long Distances and for Transport.* J. Dennis Coales. (11) Serial beginning May 2.

Fifteen Ovens of Michigan Light Company at Kalamazoo Have Capacity of 1 250 000 Cu. Ft. of High-Grade Gas per Day.* Louis Resnick. (24) May 3.

Armour's Special Testing Equipment. G. F. Gebhardt. (64) May 6.

Specifications for Leather Belting.* H. E. Weightman. (64) May 6.

Fuel Limitations of Tractor Engines. H. L. Horning. (Paper read before Soc. of Automotive Engrs.) (120) May 8.

The Tarrant Triplane.* (12) May 9; (11) May 9.

Diesel Engines Prove Economical at Lincoln.* O. J. Shaw. (17) May 10.

Cost of Fuel for Steam-Electric Stations.* Willis T. Batcheller. (111) May 15.

The Future of Peat as a Fuel.* J. B. C. Kershaw. (45) Serial beginning May 15.

A Service Study of Machine Tool Drives. H. W. Tice. (20) May 15.

Curtiss K-6 and K-12 Aircraft Engines.* (120) May 15.

Winton Diesel Engines.* (120) May 15.

Powdered Fuel for Firing Metallurgical Furnaces and Steam Boilers.* J. S. Atkinson. (Paper read before Sheffield Soc. of Engrs. and Metallurgists.) (22) May 16.

The Stevens Petrol-Electric Vehicle.* (26) May 16.

Dirt in Coal. L. J. Joffray. (Paper read before International Ry. Fuel Assoc.) (45) May 22.

Preparation of Bituminous Coal. Ernst Prochaska. (45) Serial beginning May 22.

Improved Oil-Pressure Regulation in Liberty Engine.* (From Liberty Engine Service *Bulletin No. 8.*) (120) May 22.

Continental Plant Layout Facilitates Production.* (120) Serial beginning May 22.

Flowmeters and the Calibration of Carbureter Nozzles.* G. Smith Clarke. (Abstract of paper read before Inst. of Automobile Engrs.) (120) May 22.

Model Experiments in Aeronautics.* (11) May 23.

Utilizing Mine Waste and Inferior Fuels.* F. Blache. (From *Bulletin* de la Société de l'Industrie Minerale.) (57) May 23.

The Heating and Ventilation of Workshops.* (12) Serial beginning May 23.

Our Trans-Atlantic Dirigible Entry: Some Constructional Details of the U. S. Navy Dirigible C-5. (46) May 24.

Method of Computing Gauge Table for Circular Oil Storage Reservoir with Sloping Side Walls.* E. D. Cole. (86) May 28.

Diesel Engines for Automobile Work.* (120) May 29.

The Ohio Tilted Rotary.* (120) May 29.

Progress in Utilizing Pulverized Fuel.* W. J. Bohan and others. (Progress Report read before International Ry Assoc.) (45) May 29.

Machinery Used in the Stripping of Coal.* S. B. Creamer. (45) May 29.

Factors Influencing the Properties of Silica Bricks.* Alexander Scott. (Abstract of paper read before Refractory Materials Section of Ceramic Soc.) (22) Serial beginning May 30.

The Efficient Compression of Air.* Charles A. Hirschberg. (Abstract from *Power Plant Engineering* and *Compressed Air Magazine.*) (103) May 31.

Development in the Use of Producer Gas.* Earl E. Adams. (Paper read before Am. Drop Forge Assoc.) (62) June.

The Low Pressure Exhaust Steam Turbine.* H. V. Schoepflin. (Paper read before Am. Drop Forge Assoc.) (62) June.

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* Illustrated.

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Oil-Shales. Dean E. Winchester. (3) June.
Mammoth Coke Plant.* Frank F. Marquard. (116) June.
How Do You Utilize Your Exhaust Steam? D. O. Tylee. (116) June.
An Electrically-Operated Quarry and Plant for Production of Broken Stone at Gary, Ill.* (67) June.
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Suggestions for Correct Boiler Baffling.* A. D. Williams. (116) June.
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Central Station Heating in Detroit.* J. H. Walker. (55) June.
Production of Liberty Motor Parts at Ford Plant.* W. F. Verner. (55) June.
Economy of Arizona Power Plants Using Oil Fuel.* C. R. Weymouth. (55) June.
Air Fans for Driving Generators on Airplanes.* G. Francis Gray and others. (55) June.
Rural Gas Distribution. B. Frank Buck. (Paper read before New Jersey Gas Assoc.) (83) June 2.
Displacing Natural Gas with Manufactured Gas. John H. Maxon. (Abstract of paper read before Natural Gas Assoc.) (83) June 2.
A 400-500 B. t. u. Gas Proposed for Great Britain. (Report read before British Board of Trade.) (83) June 2.
Circulation in Water-Tube Boilers.* A. Bement. (64) June 3.
Splintering Properties of Airplane Woods.* G. E. Heck. (120) June 5.
Effect of Water Injection on Gasoline Engines. (120) June 5.
Gear Steels. J. Heber Parker. (Paper read before Am. Gear Mfr.'s Assoc.) (120) June 5.
New Coal-Handling Plants for Philadelphia Water-Works.* Harrison R. Cady. (13) June 5.
The "Vickers-Vimy" Transatlantic and Commercial Aeroplanes.* (12) June 6.
The Effect of a Side-Wind on Interplane Struts.* A. J. Sutton Pippard. (11) June 6.
A New Prime Mover of High Efficiency and British Origin.* (Still Engine). Frank E. D. Acland. (29) June 6.
The "Vickers-Vimy" Passenger-Carrying Aeroplane.* (11) June 6.
The Air Receiver. Frank Richards. (12) Serial beginning June 6.
America Flies the Atlantic: The Design and Development of the N. C.-4.* (46) June 7.
Pipe-Line Flow Capacities for Natural Gas.* E. O. Hickstein. (24) June 7.
Up to 225 000 Cu. Ft. Daily, Stop-End Benches can be Operated with as Little or Less Expense than any Other Type. L. G. Crenshaw. (Paper read before Southern Gas Assoc.) (24) June 7.
Boiler-Tube Failures. Waldo Weaver. (64) June 10.
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Air Weight and Volume Measurement.* Don T. Hastings. (120) June 12.
Hydraulically Operated Shell Machines.* P. B. Cochrane. (72) June 12.
Two-Stroke Engines for Motorcycles.* E. Tilston. (Paper read before Inst. of Automobile Engrs.) (120) June 12.
The Economics of Flight.* H. B. Irving. (120) June 12.
The Influence of Hitches and Drawbar Location on Tractor Design.* A. W. Scarratt. (120) June 12.
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Carburetion of Low Grade Fuels.* O. H. Ensign. (120) June 12.
Fusibility of Ash from Pennsylvania Coals.* W. A. Selvig and A. C. Fieldner (U. S. Bureau of Mines). (45) June 12; (105) June 15.
Steam Meters.* (12) June 13.
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The Abrasion Meter.* Raymond Francis Yates. (19) June 14.
Power Requirements of Rock-Crushing Plants.* Mark H. Reasoner. (103) June 14.
Heating of Buildings by Electricity.* V. H. Greisser. (Report read before Idaho Public Utilities Comm.) (111) June 15.
Experience with Electric Heating in the Northwest.* J. D. Ross. (Report read before Idaho Public Utilities Comm.) (111) June 15.
Gas Meters 10 Years in Service Need Repairing.* H. A. Norton. (Discussion before New England Guild of Gas Mgrs.) (83) June 16.
Results from Vertical Retorts at Meriden. (83) June 16.
Tentative Code for the Regulation of Refrigeration Plants. (Adopted by Am. Soc. of Refrigerating Engrs.) (64) June 17.

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Fires in Turbo-Alternators.* (Abstract of Report of Sub-Committee read before National Elec. Light Assoc.) (64) June 17.
Care of Heating and Ventilating Equipment.* Harold L. Alt. (64) June 17.
Preparing Coal Samples for Analysis.* S. W. Parr. (64) June 17.
Alignment Charts for Finding the Dimensions and Volumes of Bumped Heads.* C. H. Berry. (64) June 17.
Refrigerating Plant No. 1, American Expeditionary Forces.* John V. Fisher. (64) June 17.
The Utilization of Gaseous Fuel in Commercial Practice.* F. W. Epworth. (66) June 17.
Cement Joints for Cast-Iron Water and Gas Mains at Vallejo, California. (13) June 19.
The British Eight-Inch Howitzer.* I. William Chubb. (72) Serial beginning June 19.
"Spontaneous Combustion." Watson Smith. (29) June 20.
Emphasizes Need of Pyrometer When Using High Pressure Blast in Water Gas Manufacture. F. L. Weisser. (From paper read before Southwestern Elec. and Gas Assoc.) (24) June 21.
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Wherein a Joint in the Outlet Pipe from a 2 000 000 Cu. Ft. Holder 18 Ft. from Tank Bottom and a Diver Cleans Out Bottom with Holder Full of Gas.* A. H. Harris, Jr. (24) June 21.
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Visualizing the Future Truck. Louis P. Kalb. (Paper read before the Soc. of Automotive Engrs. under title, "The Relation of Motor Truck Ability to the Trend of Design.") (120) June 26.
Novel Features in a Two-Cylinder Marine Set.* (120) June 26.
Late Addition to Youngstown Coke Plant.* (20) June 26.
Report of Divisions as Revised and Approved by Standards Committee.* (Soc. of Automotive Engrs.) (120) June 26.
Load Characteristics of Radio-Thrust Bearing.* F. W. Gurney. (72) June 26.
Flatness Tests at Bureau of Standards.* R. L. Rankin. (72) June 26.
The Hispano-Suiza Airplane Engine.* H. O. C. Isenberg. (72) Serial beginning June 26.
Live-Roller Motors in Steel Works. W. W. Wood. (From article in *Magnet Magazine.*) (22) June 27.
The Measurement of Steam and Water in Power Stations.* W. M. Selvey. (73) June 27.
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Manufacturing Plant of the Providence Gas Co.* Walter M. Russell. (Paper read before Am. Inst. of Chemical Engrs.) (105) Serial beginning July 1.
Exhaust Steam in Water Gas Machines.* Raymond L. Greene. (83) July 1.
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An Unconventional British Engine.* (120) July 3.
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Burning Steam Sizes of Anthracite with or without an Admixture of Soft Coal.* William P. Frey. (From *Bulletin* issued by U. S. Fuel Administration.) (45) July 3.
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La Gazéification des Houilles et le Chauffage des Fours. V. Guillermin et M. Gillot. (33) May 17.
Zur Regelung der Steuerung der gegenwärtigen Bauarten von Dampfturbinen.* Ernst Blau. (53) Serial beginning Oct. 25, 1918.
Ueber Bohrversuche mit Metallen und Legierungen. P. Ludwik. (53) Jan. 4.
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Schnellaufende Schraubenturbinen und deren wirtschaftlicher Vergleich mit Francisturbinen.* W. Zuppinger. (107) Serial beginning Apr. 5.

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The Chemical Detection of Strain in Iron and Steel by Their Reaction with Nitric Acid.* J. H. Whiteley and A. F. Hallimond. (71*a*) Vol. 9, 1918.
An Investigation on the Wearing and Antifrictional Qualities of Cast Iron.* J. E. Hurst. (71*a*) Vol. 9, 1918.
The Effects of Cold-Working on the Elastic Properties of Steel.* J. A. Van Den Broek. (71*a*) Vol. 9, 1918.
The Influence of Some Elements on the Tenacity of Basic Steel, with a New Formula for Calculating the Maximum Load from the Composition.* Andrew McWilliam. (71) Vol. 98, 1918.
Influence of Hot-Deformation on the Qualities of Steel.* Georges Charpy. (71) Vol. 98, 1918.
Report on Hardness Testing: Relation Between Ball Hardness and Scleroscope Hardness.* A. F. Shore. (71) Vol. 98, 1918.
Some Experiments on the Reaction between Pure Carbon Monoxide and Pure Electrolytic Iron Below the A-1 Inversion.* H. C. H. Carpenter and C. Coldron Smith. (71) Vol. 98, 1918.
A Method for the Prevention of Growth in Grey Cast Iron.* J. E. Hurst. (71) Vol. 98, 1918.
The Principles of Open-Hearth Furnace Design.* Chas. H. F. Bagley. (71) Vol. 98, 1918.
On the Cooling of Steel in Ingot and Other Forms.* J. E. Fletcher. (71) Vol. 98, 1918.
A Few Notes on Bosh Tuyeres.* J. S. Hollings. (71) Vol. 98, 1918.
Note on the Warping of Steel Through Repeated Quenching.* J. H. Whiteley. (71) Vol. 98, 1918.
Phosphorus in Malleable Cast Iron.* J. H. Teng. (71) Vol. 98, 1918.
On Magnetic Analysis as a Means of Studying the Structure of Iron Alloys.* Kôtaro Honda. (71) Vol. 98, 1918.
On the Rate of Change at 100° C. and at Ordinary Temperatures in the Electrical Resistance of Hardened Steel.* E. D. Campbell. (71) Vol. 98, 1918.
The Standardization of Tests for Refractory Materials.* (Report of Committee of Ceramic Soc.) (71) Vol. 98, 1918.
The Practical Management of Blast-Furnace Plants in Cleveland. H. G. Scott. (Paper read before Cleveland Inst. of Engrs.) (22) Jan. 17.
The Solubility and Stability of Iron Carbide in Cast Iron. J. A. Holden. (22) Apr. 18.
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tungen.* W. Rodiger. (107) Serial beginning Apr. 8.

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The Chemical Detection of Silicon in Iron and Steel by Their Reaction with Silver
Azide.* A. H. Whitely and H. H. Hollingsworth. (21) Vol. 9, 1910.
An Investigation on the Working and Annealing Conditions Governing the Iron.* J. E.
Stead. (21) Vol. 9, 1910.
The Effects of Cold-Working on the Ductile Properties of Steel.* J. J. Van Den
Broek. (21) Vol. 9, 1910.
The Influence of Some Elements on the Transits of Steels Such as a New
Formula for Calculating the Maximum Load from the Composition.* Andrew
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Resistance of Die-Steels to Cracking on Gas Quenching by Spray.* George Charpy. (71)
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Report on Stainless Casting: Detailed Discussion Upon Shell Hardness and Extensometer Tests.*
James A. E. Shore. (71) Vol. 98, 1912.
Experiments on the Ductile Outbreak Test Casting Microscopic and Pyro-
electric Tests Upon the Acid Invergnat.* H. W. E. Carpenter and C. Goldson
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A Method for the Prevention of Growth in Grey Cast Iron.* J. E. Stead. (71)
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Notes on the Working of Steel Through Prolonged Quenching.* I. H. Wakeley. (71)
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(Paper read before Cleveland Inst. of Engrs.) (22) Jan. 17.
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Metallic Coatings for Rust-Proofing Iron and Steel.* Henry S. Rawdon and others. (105) Serial beginning May 1.
X-Ray Examination as Applied to the Metallurgy of Steel.* Robert Hatfield and others. (Abstract of paper read before Faraday Soc. and Röntgen Soc.) (22) May 2.
Automatic Ore Handling Plant.* (22) May 2.
Steel Works Machinery.* T. W. Hands. (Paper read before Sheffield Soc. of Engrs. and Metallurgists.) (11) Serial beginning May 2.
The Electrolytic Refining of Silver and Gold.* George G. Griswold. (Paper read before Am. Electrochemical Soc.) (16) May 3.
Economics of Concentration.* A. P. Watt. (16) May 3.
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Manufacturing Non-Ferrous Metal Articles.* (20) May 8.
Copper-Smelting Slag from the Microscopic and Chemical Point of View.* C. G. Maier and G. D. Van Arsdale. (16) May 10.
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A Proposed Metallurgical Process for the Treatment of Vanadinite for the Recovery of Lead and Vanadium. J. E. Conley. (105) May 15.
Sintering Zinc Residues.* K. Stock. (105) May 15.
Fundamental Principles to be Considered in the Heat Treatment of Steel. R. A. Hayward. (105) May 15.
Steel Mill Practice and Heat Treatment.* A. F. MacFarland. (Abstract of paper read before Am. Steel Treaters' Soc.) (20) May 22.
The Metallurgy of Copper.* Thomas H. A. Eastdick. (19) May 24.
Melting of Non-Ferrous Metals and Alloys.* E. F. Collins. (Abstract of paper read before Cleveland Eng. Soc.) (27) May 24.
Non-Metallic Impurities in Steel.* Henry D. Hibbard. (Paper read before Am. Iron and Steel Inst.) (20) May 29.
Charging Raw Material into Blast Furnaces.* J. A. Mohr. (Paper read before Am. Iron and Steel Inst.) (20) May 29; (116) June.
The American Bridge Co.'s Forge Plant.* C. J. Walker. (20) May 29; (116) June.
Electrically Heated Soaking Pit.* Thaddeus F. Bailey. (Paper read before Am. Iron and Steel Inst.) (20) May 29; (116) Serial beginning June.
On the Solid and Liquid States of Steel. Cosmo Johns. (Paper read before West of Scotland Iron and Steel Inst.) (11) May 30.
A New Type of Recuperative Furnace.* Walter Rosenhain and E. A. Coad-Pryor. (Paper read before Ceramic Soc.) (11) May 30.
Mechanical Charging of Silver Lead Blast-Furnaces.* L. D. Anderson. (Abstract from *Journal* of Utah Soc. of Engrs.) (103) May 31.
Modern Forge Plant for Ordnance Work.* C. J. Walker. (Paper read before Am. Iron and Steel Inst.) (62) June.
Fusion Welding as Applied to Forge Work.* S. W. Miller. (62) June.
Notes on Welding Systems.* James Caldwell. (Paper read before Inst. of Engrs. and Shipbuilders in Scotland.) (2) June.
Sand Blasting Forgings *vs.* Pickling.* R. R. Shuman. (From paper read before Am. Drop Forge Assoc.) (62) June.
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Methods for Obtaining Better Forgings. W. C. Peterson. (Paper read before Am. Drop Forge Assoc.) (62) June.
Report of Standardization Committee.* (Am. Drop Forge Assoc.) (62) June.
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Electricity in the Making of Copper Wire.* (111) June 15.
The Use of X-Rays in Metallurgy.* Engene Schneider and others. (Abstracts of papers read before Faraday Society and Roentgen Society.) (20) June 19.
Manganese Special Work Repaired by Welding.* Julian M. Scott. (17) June 21.
Steel Wheels by a New Process.* E. F. Cone. (46) June 21.
The Properties of High Speed Steel.* G. J. Horvitz. (From paper read before Am. Steel Treaters' Soc.) (20) June 26.
A New Electric Rotating Brass Furnace.* Carl H. Booth. (Abstract of paper read before Am. Inst. of Chemical Engrs.) (20) June 26.
Factors in the Economical Production of Electric Steel. J. A. Holden. (22) June 27.
The Roasting and Magnetic Separation of Wisconsin Zinc Ores.* E. G. Dentman. (16) June 28.
Notes on Screening Practice.* John Bland. (16) June 28.
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Rocking Electric Arc Furnace.* H. M. St. John. (Extracts from paper read before Am. Inst. of Chemical Engrs.) (105) July 1.
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Some Facts About Monel Metal.* Hugh R. Williams. (64) July 1.
Electric Furnaces of the Resistance Type.* T. E. Bailey. (Extracts from paper read before Am. Inst. of Chemical Engrs.) (105) July 1.
Heat Treatment of Railroad Materials.* C. B. Bronson. (From paper read before Am. Steel Treaters' Soc.) (20) July 3; (18) July 12.
Developments in Lake Superior Milling.* C. H. Benedict. (16) July 5.
How the Inland Steel Co. Met War Demand. (20) July 10.
Desulphurizing in the Pig Iron Mixer.* L. Blum. (From *Stahl und Eisen.*) (20) July 10.
Blast-Furnace Explosions.* B. B. Hood. (16) July 12.
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La Radiographie des Métaux, l'Emploi des Rayons X pour Rechercher les Défauts Internes des Pièces Métalliques.* Ch. Dantin. (33) Mar. 8.
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Les Dévastations allemandes dans les Usines Sidérurgiques de Meurthe-et-Moselle.* Auguste Pawlowski. (33) Mar. 29.
Le Train de Laminoir à Toles de la Lukens Steel Co., à Coatesville (Pennsylvanie, E.-U.)* F. Coleru. (33) Apr. 19.
Nouveau Type de Laminoir à Cage Basculante, Système Fawell.* (33) May 31.
Elektrotechnische Anwendungen des Schoopschen Metallspritzverfahrens. (41) Jan. 16.
Ueber die Erzeugung von Elektrosthahl für Stahlformguss im basisch zugestellten Héroultofen bei Verwendung von festem Einsatz. Berthold Schudel. (107) Serial beginning Mar. 1.

Military.

Technical Engineering Details of the Hindenburg Line in the Sector of Attack of the II Army Corps.* G. P. Pillsbury. (100) Mar.
The World's Biggest Building Project.* (Cantonments.) Arthur J. Widmer. (115) Mar.
Railway Artillery.* E. D. Campbell. (115) Mar.; (18) June 14.
The Dynamical Balance of Re-oiling Parts in Heavy Gun Carriages.* G. M. Russell. (11) Apr. 18.
The Operation and Maintenance of Utilities at Army Camps and Cantonments.* George A. Johnson. (109) May.
Design and Tests of Highly Efficient Air-Lift Installation at Fort Bliss, Texas.* J. F. Brown. (13) June 5.
The British Eight-Inch Howitzer.* I. William Chubb. (72) Serial beginning June 19.
Storing and Handling High Explosives During the War.* G. C. Munoz. (13) June 26.
Light Railway Engineering in Modern Warfare.* C. H. R. Fuller. (96) July 3.
American Engineers Make Records in Bridging the Rhine.* James M. Farrin and Sam H. Andrews. (13) July 17.
Building the New Orleans Army Supply Base.* (13) July 17.
Le Développement des Fabrications de Guerre en France de 1914 à 1918.* (33) Mar. 29.
Les Mines, Sous Marines.* (33) May 10.
Entrepots Militaire due Port de New-York: La "Base" de Brooklyn.* P. Calfas. (33) May 17.
Die Nutzbarmachung der Kriegsmaterialien für den Frieden. Max Ried. (53) Oct. 18, 1918.

Mining.

Digest of the First Report of the Mine Rescue-Apparatus Research Committee.* David Penman. (106) Apr.
A Method of Determining the Magnetic Meridian as a Basis for Mining Surveys.* T. Lindsay Galloway. (106) Apr.
The Chance Acetylene Safety-Lamp.* William Maurice. (106) Apr.
Methane Accumulations from Interrupted Ventilation.* H. I. Smith and R. J. Hamon. (U. S. Bureau of Mines.) (57) Apr. 17.
Comparative Working Costs of Electrical and Compressed-Air Coal-Cutting Machines (Longwall) with Increased Outputs Over Hand Hewing. F. A. Hale. (Abstract of paper read before Assoc. of Min. Elec. Engrs.) (22) Apr. 18.
Routine Examinations and Testing of Colliery Electrical Apparatus.* L. Fokes. (57) Apr. 25.
Subsidiary Electric Haulages. A. Sharp. (Paper read before Assoc. of Min. Elec. Engrs.) (22) Apr. 25.
The Accurate Determination of Carbon Monoxide in Gas Mixtures.* J. Ivon Graham. (Paper read before Soc. of Chemical Industry.) (57) Apr. 25.
An Electrically-Driven Winding Equipment.* (26) Apr. 25; (22) May 16.
Steel Mine Ties.* R. B. Woodworth. (45) May 1.
Underground Coal-Loading Machinery.* E. N. Zern. (Abstract of paper read before Coal Min. Inst. of America.) (45) May 1.
Storage of Powder and Explosives at Coal Mines.* E. M. Kimball. (45) May 1.
New Coal Tipple at a Virginia Operation.* C. Sharon. (45) May 1.

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Metallurgical—(Continued).

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Automatic Reclosing Circuit Breakers in Mine Service.* E. C. Raney. (45) May 1.
New Tipple of the Granby Consolidated Mining, Smelting & Power Co.* F. E. Mueller. (45) May 1.
Coal Transportation by Aerial Tramway.* F. W. Grice. (45) May 1.
The Internal Corrosion of Cables.* Wm. Fleet Robertson. (103) May 3.
Recovery of Pyrite from Washery Refuse.* E. A. Holbrook. (45) May 8.
Inclined Plane of the Union Mining Co.* U. U. Carr. (45) May 8.
Economies in a Mine Power Plant.* J. A. Carruthers. (64) May 13.
Preservation of Mine Timber.* Noah Williams. (Paper read before Manchester Geological Soc.) (57) May 16; (22) May 16.
The Mauss Centrifugal Separators.* E. M. Weston. (16) May 17.
Reserve Coal Deposits Are Blocked Out at Government Mine at Eska, Alaska.* Sumner S. Smith. (From *Alaska Railroad Record.*) (45) May 22.
Coal Mine Ventilation Motors.* H. W. Chadbourne. (Abstract of article from *General Electric Review.*) (45) May 29.
Ironstone Mining in the Midlands. H. K. Scott. (From lecture given at Royal School of Mines.) (22) May 30.
Oiling Mine-Cables in Place.* Wm. Fleet Robertson. (Paper read before Canadian Min. Inst.) (103) May 31.
Know Your Battery Better. J. H. Tracy. (Paper read before Illinois Min. Inst.) (45) June 5.
Coal-Stripping Operations in Ohio.* J. B. Creamer. (45) June 5.
Method Employed in Working the Crescent Mine.* Ralph W. Mayer. (45) June 5.
Car Dumpers.* James A. Jackson. (From *General Electric Review.*) (16) June 7.
Coal Pyrite Resources of Tennessee.* E. A. Holbrook and Wilbur A. Nelson. (From "The Resources of Tennessee.") (45) June 12.
Reline Mine Shaft on Steep Slope with Concrete. (13) June 12.
Vesta Coal Co.'s Modern System of Mine Haulage.* Ralph W. Mayer. (45) June 12.
Anthracite Mining Costs.* R. V. Norris. (45) June 19.
Sealing Up Old or Abandoned Workings in Gaseous Mines. C. Thompson. (Paper read before Illinois Min. Inst.) (45) June 19.
A Peculiar Experience in Shaft-Sinking.* Arthur Jarman. (103) June 21.
Use of Concrete in Underground Works.* (From *Chemical Engineering and Mining Review.*) (16) June 21.
Sinking and Concreting Mine Shaft 936 Ft. Deep.* Richard L. Russell. (13) June 26.
Underground Motor Repair Shop.* Ralph W. Mayer. (45) June 26.
The Importance of Rail Bonding. (Mines.) E. Steck. (45) June 26.
Illinois Coal Mine Electrified Throughout.* (27) June 28.
Sealing Water in California Oil Fields.* Seth S. Langley. (16) July 5.
Electric Hoisting Equipment at the Butte & Superior Mine.* Oliver E. Jager. (103) July 5.
Electrical Transmission of Power in and About Coal Mines. S. W. Farnham. (Abstract of paper read before Illinois Min. Inst.) (45) July 10.
Modern Shaft Mine at Amsterdam, Ohio.* Jack L. Ball. (45) July 10.
Electric Blasting Equipment.* L. D. Rowell. (16) July 12.

Miscellaneous.

Final Report of the Committee on Depreciation.* (Am. Water Works Assoc.) (59) Mar.
A Method of Determining the Magnetic Meridian as a Basis for Mining Surveys.* T. Lindsay Galloway. (106) Apr.
The Accurate Determination of Carbon Monoxide in Gas Mixtures.* J. Ivon Graham. (Paper read before Soc. of Chemical Industry.) (57) Apr. 25.
Outlining Cost Systems for Forge Plants. C. Oliver Wellington. (62) May.
The Oxidation of Ammonia.* W. S. Landis. (Paper read before Am. Electrochemical Soc.) (105) May 1.
Copper-Smelting Slag from the Microscopic and Chemical Point of View.* C. G. Maier and G. D. Van Arsdale. (16) May 10.
Controlling Production in a Motor Plant.* Charles Lundberg. (20) May 15.
Industrial Air Conditions.* J. Esten Bolling. (Abstract of paper read before Cleveland Eng. Soc.) (117) May 15.
Photography in Research.* Arthur G. Eldredge. (105) May 15.
The Oxidation of Ammonia.* (105) May 15.
Rubber as a Colloid. D. F. Twiss. (Paper read before Soc. of Chemical Industry.) (19) May 17.
Methods and Costs of Stump Removal in Land Clearing.* (*Bulletin* issued by Univ. of Wisconsin.) (86) May 21.
The Cost Accounting System of Construction Division, U. S. Army.* C. W. Pinkerton. (86) May 21.

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Methods Used in Aëro-Photographic Mapping.* (13) May 22.
Present Status of Photographic Mapping from the Air. J. B. Mertie. (13) May 22.
The Present Status of Nitrogen Fixation.* Alfred H. White. (Abstract of paper read before Am. Inst. of Chemical Engrs.) (19) May 24.
Use of Army Gas Masks in Atmosphere Containing Sulphur Dioxide.* A. C. Fieldner and S. H. Katz. (U. S. Bureau of Mines.) (105) June 1; (103) June 7.
The Oxidation of Ammonia. J. R. Partington. (Paper read before King's College.) (19) June 7.
Making the Universal Reagent: The Manufacture of Sulphuric Acid by the Chamber Process. T. R. Horney. (19) June 14.
The Chemistry and Constitution of Coal.* A. C. Fieldner. (Paper read before Kentucky Min. Inst.) (45) June 25.
Graphical Differentiation and Integration.* Theodore R. Running. (From *Michigan Technic.*) (86) June 25.
General Principles of Industrial Lighting.* (National Safety Council.) (86) June 25.
Storing and Handling High Explosives During the War.* G. C. Munoz. (13) June 26.
The United States Government Chlorine-Caustic Soda Plant at Edgewood Arsenal, Edgewood, Maryland.* Samuel M. Green. (105) July 1.
Production et Mesure des Vides Elevés. (33) Feb. 15.
Les Besoins de la France en Bois Communs et les Ressources de nos Fôrets Coloniales. (33) Feb. 22.
La Réglementation Nationale et Internationale de la Durée du Travail. Paul Razous. (33) Mar. 8.
Les Principaux Composés Organiques Dérivés de l'Acétylène; Synthèses Industrielles de l'Alcool, de l'Acide, de l'Anhydride et des Ethers Acétiques, du Butadiène, etc.* D. Florentin. (33) Serial beginning Mar. 15.
L'Orientation Professionelle des Blessées de la Guerre.* Paul Razous. (33) May 17.
Erddruck bei rückwärtig begrenzter Hinterfüllung.* Max Buchwald. (78) Feb. 5.
Wissenschaftliche Betriebführung. Victor Frey. (107) May 24.

Municipal.

Notes on Grading and Planting Plans for Government Housing Projects. H. V. Hubbard. (119) Apr.
Factors Governing Selection of Industrial Site. Harland Bartholomew. (13) May 1.
The Relation of Sunlight to Town Planning. H. L. Seymour. (From paper read before Royal Astronomical Soc.) (86) May 7.
Municipal Engineers and Problems of Reconstruction. E. J. Elford. (114) May 24.
Municipal Works in the County Borough of Bournemouth.* F. P. Dolamore. (114) May 24.
The Zone Fare in Practice—Dublin.* Walter Jackson. (17) Serial beginning May 31.
A Solution of the Housing Problem in the United States.* Milo Hastings. (6) June.
Housing Activities About the World. (6) June.
Some Engineering Problems of Regional Planning. Morris Knowles. (Abstract of paper read before National Conference on City Planning.) (13) June 12.
La Ville de Genève, sa formation et son développement futur.* Camille Martin. (107) Apr. 5.
Indeen-Wettbewerb zu einen Bebauungs plan der Stadt Biel und ihrer Vorortgemeinden, Nidau, Madretsch, Mett, Brügg und Port.* (107) Serial beginning Mar. 15.
Wettbewerg für eine Gartenstadt der Firma Piccard, Pictet & Cie. in Aire bei Genf.* (107) Serial beginning Apr. 26.

Railroads.

Maintenance of Freight Equipment. H. L. Shipman. (61) Feb. 17.
Timber Preservation. H. S. Sackett. (61) Feb. 17.
Mechanical Stoking of Locomotives.* W. S. Bartholomew. (61) Mar.
A Technical Description of the British Light Railways in France.* B. W. Guppy (100) Mar.
Railway Artillery.* E. D. Campbell. (115) Mar.; (18) June 14.
Electrification of Main Line Railroads.* W. B. Potter and S. T. Dodd. (61) Apr. 21.
Pulverized Fuel Locomotive.* (12) Apr. 25.
Railway Electrification. John Murphy. (5) May.
The Economics of Electric Operation of Railways. W. G. Gordon. (5) May.
Storage Battery Cars for Use in Yucatan.* (25) May.
The Effect of Gradients on Train Resistances.* H. C. Webster. (21) May.
Creosote Treatment of Car Timbers.* (25) May.

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Methods Used in Aero-Photographic Mapping.* (14) May 22.
Present Status of Photographic Mapping from the Air. L. H. Morris. (14) May 22.
The Present Status of Airplane Flotation.* Alfred H. White. (Abstract of paper read before Am. Inst. of Chemical Engrs.) (19) May 24.
Use of Army Dirigibles in Aerophotography. Sanford Alexander Moss.* A. G. Bradley and S. H. Reed. (2) 2d Division of Militia. (10d) June 1. (10d) June 7.
The Operation of Airships. C. M. Chapman. (Paper read before King's College, London.) (19) June 7.
Making the Universal Camera: The Manufacture of Goerz Lenses for the Chemist. Process. T. H. Harvey. (19) June 14.
The Chemistry and Composition of Coal.* A. C. Fraikner. (Paper read before Chemical Soc., Lond.) (19) June 22.
Chemical Deterioration and Preservation.* Theodore B. Hunting. (From Monthly Bulletin.) (18) June.
Compound Propellers of Internal Lubrication.* (National Safety Council.) (18) June 22.
Storing and Handling Mine Explosives During the Winter. C. C. Munro. (14) June 25.
The Use of Solid Corrugated Cylinder-Screw Coils Plant at Edgewood Arsenal. E. Armand Schwartz.* Summary M. Orman. (10d) June 2.
Precautions to Observe when Using Carbon Tetrachloride. (14) June 18.
Les Explosifs au Point de Vue Commun et les Explosifs de Sureté. (Safety Explosives.) (14) May 28.
Les Explosifs Nouveaux et Internationaux de la Marine du Travail. (Coal Explosives.) (14) May 5.
Les Principaux Composés Organiques Dérivés de l'Acétylène: Propriétés industrielles et Analyse. (Organic Compounds Derived from Acetylene: Industrial Properties and Analysis.)* G. Pellerin. (14) Apr. 28.
Contribution à l'Etude de l'Anhydride et des Hydrates d'Acide Azotique. (Contribution to the Study of Nitric Acid Anhydride and Hydrates.)* Daniel Berthelot. (14) May 5.
Contribution Préliminaire aux Dilutions de la Dynamite.* Paul Bacon. (14) May 5.
Nouvelle Méthode Générale d'Analyse des Explosifs.* Jean Cavalier. (14) May 5.
Wissenschaftliche Begründung. Victor Frey. (10d) May 21.

Magazines.

Notes on Grading and Planting Plots for Experimental Planting Problems. H. V. Hayes. (Forestry.) (11d) Apr.
Electric Interlocking Machines at Universal Sta. Electrical Engineering. (14) May 5.
The Relation of Profits to Town Planning. H. C. Hennessy. (Town Planning Review.) Before Royal Agricultural Soc. (18d) May 7.
Mineral Springs and Problems of Prospecting. H. J. Wood. (14) May 12.
Mineral Wells in the County Borough of Portsmouth.* C. E. Robinson. (14) May 12.
The Town Plan in Practice—London.* Walter Jerrold. (17) Build Beginners' Supplement, May 12.
A Solution of the Housing Problem in the United States.* Alva Agnew. (6) June.
Housing Activities Abroad the World. (6) June.
Some Engineering Problems of Electrical Pipelines. Morris Knowles. (Abstract of paper read before National Technical Conference on City Planning.) (11) June 11.
La Ville de Genève, sa Formation et son développement Urbain.* Camille Martin. (10?) Apr. 8.
Indoor Wettbewerb zu einem Bebauungs plan des Stadt Biel und ihrer Vororte.* Hermann Soldat, Madretsch Biel, Bürge und Port.* (10?) Serial beginning May 12.
Wettbewerb für eine Gartenstadt für Stadt Basel. Preis d'Ile in Alte bei Genf.* (10?) Serial beginning May 22.

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Maintenance of Permanent Equipment. H. E. Shipman. (6) Feb. 17.
Timber Preservation. H. S. Sackett. (6) Feb. 17.
Mechanical Stoking of Locomotives.* W. S. Hartshorne. (6) Mar.
A Technical Description of the British Light Railways in France.* B. W. Dodge (10d) May.
Railway Artillery.* E. D. Campbell. (11?) May. (18) June 14.
Electrification of Main Line Railroads.* W. B. Potter and S. T. Dodd. (6) Apr 22.
Pulverized Fuel Locomotive.* (12) Apr 22.
Railway Electrification. John Stevens. (3) May.
The Economics of Electric Operation of Railways. W. D. Gordon. (3) May.
Storage Battery Cars for Use in Tunnels.* (18) May.
The Effect of Gradients on Train Resistances.* H. G. Webster. (11) May.
Corrosa Treatment of Car Timbers.* (18) May.

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Standard 4-6-2 Type Locomotives.* (25) May.
Overcoming Neglected Maintenance in a Terminal. W. F. Rench. (87) May.
Autogenous Welding at Albuquerque.* H. Louis Hahn. (25) May.
Checking the Service of Treated Ties.* (87) May.
Treating Montana Waters.* C. Herschel Koyl. (87) May.
Draft Gear Test Demonstrations.* (25) May; (15) May 2; (18) May 3.
Railroad Electrification.* F. H. Shepard. (5) May.
Line Revision on Cincinnati Southern Railroad.* (13) May 1.
Reinforced Concrete Framed Railway Abutments.* Albert M. Wolf. (117) May 1.
Brown Boverè Locomotives for the Swiss Federal Railways.* J. Buchli. (11) Serial beginning May 2.
Novel Features in New D. & R. G. Freight Terminal.* (15) May 2.
Steel Car Repair Shop, New York Central R. R.* (18) May 3.
History and Use of Easement Curves for Railroads. Philip O. Macqueen. (13) May 8.
New York Central R. R. Engine Terminal, Gardenville, New York.* (18) May 10.
Three-Cylinder Locomotives.* H. Holcroft. (12) May 16.
The Wind Resistance on a Train.* C. F. Dendy Marshall. (12) May 16.
Supply and Transmission for Modern Railway Signalling.* A. E. Tattersall. (21) May 21.
Damage to Rail by Flat Spots on Freight Car Wheels. (86) May 21.
Using Modern Appliances in Track Construction.* (17) May 24.
Glenwood Shop Improvements, Baltimore & Ohio R. R. (18) May 24.
General Solution of Problems in Railway Compound Curves.* Antonio Llano. (13) May 29.
Lame Engines and Their Effect on Fuel Consumption. J. W. Hardy. (Paper read before International Ry. Fuel Assoc.) (15) May 30.
Missouri Pacific Saves $279 843 by Water Treatment.* R. C. Bardwell. (15) May 30.
The Effect of Reducing Exhaust Nozzles to Overcome Front End Air Leaks. F. P. Roesch. (Paper read before International Ry. Fuel Assoc.) (15) May 30; (25) July.
Rectangular Engine House, Long Island R. R.* L. U. Morris. (18) May 31.
Pacific Type Locomotive, Lehigh Valley R. R. (18) May 31.
C. P. R. Shop Production Methods.* E. T. Spidy. (25) June.
Locomotive Repair Shop Output.* Henry Gardner. (25) June.
New York Central Steel Car Shop.* (25) June.
The New B. & O. Shops at Glenwood.* (25) June.
A Turntable of Unique Design.* (25) June; (15) June 13.
Erie Railroad has Installed Freight Handling Equipment.* (117) June 1.
Derails and Where They Should be Used. (15) June 6.
Oerlikon Locomotives for the Swiss Federal Railways.* (11) June 6.
Concrete Tunnel Lining by Steam Jet.* (18) June 7.
When Freight Cars Bump.* J. Hammond Smith. (46) June 7.
Illumination of Toledo & Ohio Central Engine Terminal at West Columbus, O.* R. E. Rice. (18) June 7.
Regenerative Direct-Current Electric Railways. E. Austin. (26) June 13.
A New Locomotive Repair Shop Built for the B. & O.* (15) June 13.
Branch Line Operation with Self-Propelled Motor Cars.* H. W. Protzeller. (17) June 14.
Electric Locomotives of Moderate Weight and Power.* A. B. Cole. (17) June 14.
Methods Used in Third-Rail Bonding.* G. H. McKelway. (17) June 14.
Types of Third-Rail Used in Railway Electrification.* (17) June 14.
Fitting the Electric Locomotive to Its Load. A. H. Babcock. (Abstract of paper read before the Pacific Ry. Club.) (17) June 14.
New York Central's Latest Motor Cars.* (17) June 14.
Unit Steam Railway Motor Car.* (18) June 14; (15) June 18.
Erie Avenue Engine Terminal, Philadelphia & Reading Ry.* (18) June 14.
The Toronto Terminal Railway Co.'s New Station.* H. A. Gardner. (117) June 15.
P. R. R. Maximum Tonnage Hopper and Gondola Cars.* (15) June 18; (18) July 12.
Report of Committee on Brake Shoe and Brake Beam Equipment.* (Am. Ry. Assoc.) (15) June 19.
Big Four Increases Capacity at Congested Points.* (15) June 20.
P. R. R. General Utility Express and Baggage Car.* (15) June 20.
Report of Committee on Welding Truck Side Frames, Bolsters and Arch Bars.* (Am. Ry. Assoc.) (15) June 20 (Daily ed.).
Report of Committee on Specification and Tests for Materials (M. C. B.).* (Am. Ry. Assoc.) (15) June 20 (Daily ed.).
Report of Committee on Car Wheels.* (Am. Ry. Assoc.) (15) June 20 (Daily ed.).
Report of Committee on Depreciation for Freight Cars. (Am. Ry. Assoc.) (15) June 20 (Daily ed.).

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Report of the Committee on Draft Gears.* (Am. Ry. Assoc.) (15) June 20 (Daily ed.).
Car Performance from the Engineer's Office to the Track.* C. W. Squier. (17) June 21.
Report of the Standing Committee on Loading Rules.* (Am. Ry. Assoc.) (15) June 21.
Report of the Standing Committee on Safety Appliances.* (Am. Ry. Assoc.) (15) June 21.
Report of Committee on Car Construction.* (Am. Ry. Assoc.) (15) June 21.
Report of Committee on Car Trucks.* (Am. Ry. Assoc.) (15) June 21.
Report of Train Lighting and Equipment.* (Am. Ry. Assoc.) (15) June 23.
Report of the Committee on Tank Cars.* (Am. Ry. Assoc.) (15) June 23.
Report of Committee on Mechanical Stokers.* (Am. Ry. Assoc.) (15) June 24.
Report of Committee on Fuel Economy and Smoke Prevention.* (Am. Ry. Assoc.) (15) June 25.
Carbonization in Valve Chambers and Cylinders of Superheated Steam Locomotives.* F. P. Roesch. (Paper read before Am. Ry. Assoc.) (15) June 25; (18) July 5.
Report of Committee on Superheated Locomotives. (Am. Ry. Assoc.) (15) June 25.
Report of Committee on Locomotive Headlights.* (Am. Ry. Assoc.) (15) June 25.
Report of Committee on Specification and Tests for Materials (A. R. M. M.).* (Am. Ry. Assoc.) (15) June 25.
Drawbar Pull-Speed-Cut-Off Calibration as an Adjunct to Efficiency Locomotive and Train Operation.* B. B. Milner. (Paper read before Am. Ry. Assoc.) (15) June 25; (18) June 28.
Combustion Chambers.* F. F. Gaines. (15) June 26.
Design, Maintenance and Operation of Electric Rolling Stock.* (Abstract of Report read before Am. Ry. Assoc.) (15) June 26.
Use of Bronze for Valve Snap Rings and Piston Surfaces, and Bull Rings in Large Cylinders.* C. E. Fuller. (Paper read before Am. Ry. Assoc.) (15) June 26; (18) June 28.
Air Consumption of Locomotive Auxiliary Devices.* (Abstract of Report read before the Air Brake Assoc.) (25) July.
Box Cars for Chilean Railway.* (25) July.
C. C. C. & St. L. 0-8-0 Switchers.* R. W. Retterer. (25) July.
Constructing a Track Layout in Close Quarters.* W. F. French. (87) July.
Limit of Wear for Steel Wheels.* (25) July.
The Longitudinal Disturbing Forces in Locomotives.* Edward L. Coster. (25) July.
Master Boiler Makers' Convention: Reports and Discussions.* (25) July.
Standard Light Mountain Type.* (25) July.
The Air Compressor in Maintenance Work.* Walter P. Burn. (87) July.
Engine Terminal Improvements: Pennsylvania Lines West.* (13) July 3.
Heat Treatment of Railroad Materials.* C. B. Bronson. (From paper read before Am. Steel Treaters' Soc.) (20) July 3.
Light Railway Engineering in Modern Warfare.* C. H. R. Fuller. (96) July 3.
Grand Trunk 0-6-0 Type Switching Locomotives.* (15) July 4.
Utility Express Car of the Pennsylvania Railroad. (18) July 5.
Practices and Tendencies in Japanese Electric Railway Transportation.* Shiro Sano. (17) July 5.
The Relative Economy of Freight Transport by Railway and by Motor Truck.* Charles Whiting Baker. (13) July 10.
Union Station is Rebuilt Without Interrupting Traffic.* (13) July 10.
Extensive Electrification Proposed for Sweden.* (15) July 11.
Illinois Central Will Build New Chicago Terminal.* (15) July 11.
Methods of Observing and Analyzing Passenger Traffic.* R. H. Horton. (17) July 12.
Proposed New Passenger Terminal in Chicago.* (18) July 12.
Narrow-Gage Railway Operation at Munition Plant.* James A. Silsbee. (13) July 17.
Opening Old Railroad Fill Reveals Reasons for Track Trouble.* R. Reimann. (13) July 17.
Deux Questions Intéressant les Réseaux d'intérêt Local Après la Guerre: 1° Formule d'Exploitation à Coefficients Variables; 2° Réduction des Opérations de Transbordement.* Claise. (43) Jan.
L'Etat Actuel et l'Avenir de nos Chemins de Fer d'Intérêt Local; les Chemins de Fer Agricoles. G. Mangin. (33) Serial beginning Feb. 15.
Dispositifs pour le Raccourcissement des Traversées-Jonctions.* A. Goupil. (33) Mar. 15.
L'Etat Actuel des Chemins de Fer Chinois.* G. Bouillard. (33) Apr. 5.
L'Electrification des Chemins de Fers français, sa Répercussion sur les Services Téléphoniques et Télégraphiques.* P. Letheule. (33) Serial beginning Apr. 26.

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L'Emploi du Charbon Pulvérisé sur les Locomotives.* E. Lassueur. (33) May 3.
La Réconstruction de la Gare de Weimar (Saxe).* A. Goupil. (33) May 10.
Die Kohlennot und die Elektrisierung der Bahnen. (53) Jan. 3.
Probleme im Lokomotivbau und-betrieb.* R. Sanzin. (53) Serial beginning Jan. 4.
Zur Neuordnung der deutschösterreichischen Staatsbahnverwaltung. Bruno R. v. Enderes. (53) Jan. 31.
Tunnelbau unter Wasser.* A. Haag. (40) Feb. 1.
Der Bau der Bagdadbahn im Lichte der Kriegswirtschaft.* Walter Morf. (107) Serial beginning Feb. 22.
Akkumulatoren-Verschiebelokomotive mit Windwerk.* S. Abt. (107) Mar. 22.
Die Elektrifizierung der Schweiz. Bundesbahnen. E. Huber-Stockar. (107) Serial beginning Mar. 29.

Railroads, Street.

Six Years of Rapid-Transit Progress in New York.* D. L. Turner. (13) May 1.
Post-Payment Center-Exit Car in Philadelphia.* (17) May 3.
Chicago Rehabilitation Track Standards Prove Successful.* (17) May 3.
Safety Cars in Gary Make Jitneys Unprofitable.* (17) May 17.
Relieving Congestion at the "Diamond" in Youngstown.* (17) May 17.
Bournemouth Corporation Tramways.* I. Bulfin. (114) May 24.
Cement and Concrete Testing for Subway and Elevated Lines in New York City. (86) May 28.
Street-Car Loop Subway Proposed by Pittsburgh.* (13) May 29.
Car Body Maintenance in Belfast.* P. Williamson. (17) May 31.
The Zone Fare in Practice—Dublin.* Walter Jackson. (17) Serial beginning May 31.
Relieving Congestion in Baltimore's Delivery District.* L. H. Palmer. (17) June 7.
Cutting Most of the Compromise Out of the Compromise Joint.* (17) June 7.
Overhead and Time Cost to Erect Elevated Railway. A. P. Roscoe. (13) June 12.
Manganese Special Work Repaired by Welding.* Julian M. Scott. (17) June 21.
Continuous Trains for Forty-Second Street Transit.* Henry B. Seaman. (13) June 26.
Sewer Work Puts Extra Tax on Way Department in Brooklyn. (17) June 28.
Risers Increase Life of Frogs and Mates.* C. L. Hawkins. (17) June 28.
Selbsttätige Wagenkupplung für Strassenbahnen.* (107) Apr. 26.

Roads and Pavements.

Design of Concrete Sidewalks and Concrete Curb and Gutter at Street Intersections.* W. Robert Paige. (60) May.
Poor Brick Causes Pavement Failure—The Saving of $50 for Tests Leads to Failure of a $50 000 Job.* C. C. Wiley. (60) May.
Design and Construction of the Dixie Highway from Rockwood to Monroe, Mich. Leroy C. Smith. (60) May.
Design and Construction of the Monolithic Brick Road South of Seneca, Ill.* A. H. Hunter. (60) May.
Procedure in Constructing an Open Joint Wood Block Pavement at Toledo, Ohio.* Raymond Pierce. (60) May.
Some Specific Suggestions on the Drainage of Roads. (60) May.
Cost of Highway Concrete Delivered Wet by Trucks.* (13) May 1.
Defects in Surface of Bituminous Pavement Due to Concrete Base.* H. W. Skidmore. (13) May 1.
Charging Concrete Mixers on Road Work. Wm. Ord. (16) May 1.
The Cost of a Mile of Road. George A. Duren. (From paper read before an Engineering and Road Builders' Congress at Mineral Wells.) (86) May 7.
Effect of Tractive Resistance in Terms of Gasoline Consumption. (86) May 7.
General Features of Brick Pavement Construction. A. T. Goldbeck and F. H. Jackson. (From *Public Roads.*) (86) May 7.
Special Types of Brick Pavement Construction. (From *Public Roads.*) (86) May 7.
Machine Finishing Concrete Roads.* E. G. Carr. (86) May 7; (67) June.
Sidewalk Construction for New Boulevard Link, Chicago.* (86) May 7.
Illinois Adopts a Uniform Basis of Design for All Types of Rigid Pavement. Clifford Older. (13) May 8.
Bituminous Macadam. A. W. Dean. (Paper read before Canadian Good Roads Congress.) (96) May 22; (86) June 4.
Hot Mix Asphalt Pavements. Francis P. Smith. (Abstract of paper read before Canadian Good Roads Congress.) (96) May 22; (13) June 5.
Road Machinery. Arthur H. Blanchard. (Paper read before Canadian Good Roads Congress.) (96) May 29; (86) June 4; (13) June 5.
Highway Maintenance. J. A. Duchastel. (Paper read before Canadian Good Roads Congress.) (96) May 29.

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Roads and Pavements—(Continued).

Gravel Roads.* Chas. Talbot. (Paper read before Canadian Good Roads Congress.) (96) May 29.
Concrete in Roads, Bridges and Culverts.* H. Eltinge Breed. (Paper read before Canadian Good Roads Congress.) (96) May 29; (60) June; (13) June 5.
Handling Materials on a Michigan Road Job. (67) June.
The Design and Construction of Modern Granite Block Pavements with Special Reference to Practice in Borough of Manhattan.* C. M. Pinckney. (60) June.
Highway Requirements for Twentieth Century Transportation, with Special Reference to New Jersey Practice. Wm. G. Thompson. (Abstract of paper read before National Highway Traffic Assoc.) (60) June; (86) June 4.
How Albany, N. Y. Saved Over $360 000 in Using Re-Dressed Granite Paving Blocks.* (60) June.
Location of Subsurface Pipe Lines to Conserve Street Pavement. Harry M. Adams. (60) June.
Road Surfacing with Sand Clay from Salt-Flats. R. H. Phillips. (From *Public Roads.*) (86) June 4.
Use of Calcium Chloride as Dust Preventive on Gravel Roads. W. Leroy Ulrich. (From *Public Roads.*) (86) June 4.
Methods of Constructing Roads Through Sandhill Regions. Paul E. Brown (Abstract of paper read before Nebraska Road Inst.) (86) June 4.
Winter Roads. A. Lalonde. (Paper read before Canadian Good Roads Congress.) (96) June 5.
Multiple-Strip Concrete Road to Conserve Material.* (13) June 12.
How to Obtain Best Results in Constructing 1-Course Bituminous Macadam. F. C. Pillsbury. (From *Public Roads.*) (86) July 2.
Suggestions for the Construction of Concrete Roads.* Clyde E. Learned. (From *Public Roads.*) (86) July 2.
Method of Staking Out Concrete Fords or Dips.* George A. Duren. (From *Concrete Highway Magazine.*) (86) July 2.
Instruction for Field Inspection of Road Materials. (Issued by New Jersey State Highway Dept.) (86) July 2.
Water and the Subgrade. J. L. Harrison. (From *Public Roads.*) (86) July 2.
Paving Blocks and Sectional Paving for Railway Tracks.* (17) July 5.
Character and Cost of Highways for Motor Truck Use.* S. Whinery. (13) July 10.
Road-Construction Problem in West Virginia Mountains.* M. A. Rogers. (13) July 10.
Comparison of Road Subgrade and Air Temperatures.* C. C. Wiley. (13) July 17.
Tests of Thin-Base Monolithic-Brick Road.* Harlan H. Edwards. (13) July 17.
Die natürliche Beleuchtung der Strasse.* A. Burchard. (40) Jan. 18.

Sanitation.

A Few Notes on Sewage Works of the Aircraft Manufacturing Company at Kingsbury. R. C. N. Newport. (114) May.
The Operation and Maintenance of Utilities at Army Camps and Cantonments.* George A. Johnson. (109) May.
Land Drainage Procedure in Iowa.* G. D. Hart. (60) May.
Sewage Disposal of the Loop District, Chicago.* C. D. Hill. (117) May 15.
Disposal of Sewage by Treatment with Acid. Edgar S. Dorr and Robert Spurr Weston. (96) May 15.
Operation of Fine Sewage Screens at Long Beach, California. (13) May 22.
Irrigation Schemes in Egypt and the Sudan.* (12) Serial beginning May 23.
Some Broader Aspects of Rain Intensities in Relation to Storm Sewer Design.* Robert E. Horton. (60) Serial beginning June.
Some Unusual Sewerage Problems and How They Were Solved at Ocean Beach, New York.* Andrew J. Provost, Jr. (60) June.
Sanitation without Sewers. (117) June 1.
Chicago's Relief Sewers.* C. D. Hill. (117) June 1.
The Numerical Interpretation of Bacteriological Tests.* Milton F. Stein. (13) June 5.
Moore Park Drainage System, Toronto.* (96) June 5.
Trade-Waste Treatment Studies in Wisconsin. E. J. Tully. (13) June 12.
Chicago's Standard of Sewer Construction. C. D. Hill. (117) June 15.
Test of Air Diffusers for Activated Sludge Process.* F. L. Mickle. (From *Bulletin* issued by Division of State Water Supply of Illinois.) (86) July 9.
Sewer-Construction Records Used at Scarsdale, New York.* Perry Thompson. (13) July 17.
Die Melioration der Linksufrigen Linthebene in den Kantonen Schwyz and St. Gallen.* (107) Mar. 1.

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Roads and Pavements—(Continued).

Gravel Roads.* Chas. Talbot. (Paper read before Canadian Good Roads Convention.) (90) May 22.

Concrete in Roads, Bridges and Culverts.* H. Bliven Brook. (Paper read before Canadian Good Roads Convention.) (90) May 29; (91) June 5; (13) June 5.

Handling Materials on a Stubborn Road Job. (97) June.

The Design and Construction of Modern Granite Block Pavements with Special Reference to Practice in Chicago at Massachusetts.* C. M. Jacobsen. (90) June.

Highway Requirements for Twentieth Century Transportation, with Special Reference to New Jersey Practice. Wm. P. Thompson. (Abstract of paper read before National Highway Traffic Association.) (90) June; (88) June 5.

How Boston, N. Y., Saved Over $300,000 in Using Medicated Granite Paving Blocks.* (90) June.

Location of Submarine Pipe Lines in Concrete Sewer Pavement. Harry E. Adams. (90) June.

Road Surfacing with Sand Clay from Salt Flats. E. H. Phillips. (From Public Roads.) (89) June 4.

Use of Calcium Chloride as Dust Preventive on Gravel Roads. W. Leroy Clark. (From Public Roads.) (89) June 4.

Methods of Constructing Roads Through Swampy Regions. Paul E. Brown. (Abstract of paper read before Nebraska Road Inst.) (88) June 5.

Water Roads. A. Lakonde. (Paper read before Canadian Good Roads Convention.) (90) June 8.

Multiple-Strip Concrete Road to Conserve Material.* (13) June 12.

How to Obtain Best Results in Constructing Concrete Highways. P. C. Pillsbury. (From Public Roads.) (89) June 5.

Suggestions for the Construction of Concrete Roads.* Clyde E. Learned. (From Public Roads.) (89) July 2.

Method of Sealing Out Concrete Roads at Dips.* George Z. Dyer. (From Public Roads Bureau Agronomy.) (89) July 2.

Instruction for Field Inspection of Road Materials. (Issued by New Jersey State Highway Dept.) (89) July 2.

Water and the Subgrade. J. L. Barrion. (From Public Roads.) (89) July 2.

Paving Blocks and Sectional Paving for Railway Tracks.* (12) July 3.

Character and Cost of Highways for Motor Truck Use.* S. Whitney. (13) July 10.

Road-Construction Problem in West Virginia Mountains.* M. A. Rogers. (13) July 10.

Comparison of Road Subgrade and Air Temperatures.* C. C. Wiley. (13) July 17.

Tests of Thin-Base Macadam-Brick Road.* Marian H. Dewey. (13) July 17.

Die natürliche Bestemmung der Strasse.* A. Burdeau. (40) Jan. 18.

Sanitation.

A Few Notes on Sewage Works of the Aircraft Manufacturing Company at Hounslow. H. C. N. Newport. (114) May.

The Operation and Maintenance of Latrines at Army Camps and Cantonments. George A. Johnson. (109) May.

Land Drainage Procedure in Iowa.* C. B. Hart. (90) May.

Sewage Disposal of the Loop District, Chicago.* C. G. Hill. (117) May 15.

Disposal of Sewage by Treatment with Acid. Edgar Z. Dorr and Robert Spurr Weston. (90) May 15.

Operation of Pine Avenue Screens at Long Beach, California. (13) May 22.

Irrigation Schemes in Egypt and the Sudan.* (12) Serial beginning May 22.

Some Broader Aspects of Rain Intensities in Relation to Storm Sewer Design.* Hoyt E. Horton. (90) Serial beginning June.

Some Unusual Sewerage Problems and How They Were Solved at Ocean Beach, New York.* Andrew J. Provost, Jr. (90) June.

Sanitation without Sewers. (117) June 5.

Chicago's Outlet Sewers.* C. G. Hill. (117) June 5.

The Numerical Interpretation of Bacteriological Tests.* Milton E. Noble. (13) June 5.

Moore Park Drainage System, Toronto.* (90) June 5.

Trade-Waste Treatment Studies in Wisconsin. E. J. Tully. (13) June 12.

Chicago's Standard of Sewer Construction.* C. G. Hill. (117) June 15.

Test of Air Diffusers for Activated Sludge Process.* N. J. Hoyle. (From Bulletin Issued by Division of Mines, Water Supply of Illinois.) (89) July 9.

Sewer-Construction Needs Cited at Recordable, New York.* Percy Thompson. (13) July 17.

Die Meliorration der Liegenschaften Limbshome in den Kantonen Schwyz und St. Gallen.* (107) Mar. 1.

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Structural.

The Protection of Iron with Paint Against Atmospheric Corrosion.* J. Newton Friend. (71*a*) Vol. 9, 1918.
Handling and Storing Bulk Cement.* Wallace R. Harris. (4) Jan.
The World's Biggest Building Project.* Arthur J. Widmer. (115) Mar.
The Lighting of Buildings. (*Bulletin* issued by Illuminating Eng. Soc.) (6) Serial beginning May; (86) May 28.
Why Materials of Construction Should be Treated Prior to Their Use. Emmanuel Mavant. (60) May.
An Aircraft Shed.* Frank Baines. (114) May.
Practical Rules for the Seasoning of Wood.* Harold S. Betts. (Abstract from *Bulletin* issued by U. S. Dept. of Agriculture.) (87) May.
Physical Properties of Mortars and Concretes.* H. M. Thompson. (96) May 1.
Reinforced Concrete Building for Canadian National Railways Coach Cleaning and Storage Yard, Halifax Ocean Terminals, Halifax, N. S.* J. J. Macdonald. (96) May 1.
Concrete-Frame Factory Building Has Wooden Roof. W. E. Turner. (13) May 8.
Erecting Long-Span Roof Over Steel Mill by Rolling Trusses to Place.* (13) May 8.
Bulking Effect of Moisture in Sands.* Llewellyn N. Edwards. (96) May 15.
Construction of Army Supply Base at Norfolk.* (117) May 15.
Improving Concrete by Rodding. F. E. Giesecke. (13) May 15; (86) May 21.
Strength of Various Long Columns.* William Jackson. (96) May 22.
Reinforcing Steel Stacks with Gunite Concrete.* M. C. Sherman. (64) May 27.
Practical Considerations in Design of Steel Mill Buildings. R. Fleming. (Abstract of paper read before Buffalo Eng. Soc.) (86) May 28.
Cement and Concrete Testing for Subway and Elevated Lines in New York City. (86) May 28.
Faulty Foundation Causes Serious Damage to Armory.* (13) May 29.
Brick Chimney Carried on Platform at Roof of Building.* J. G. Mingle. (13) May 29.
How One Contractor Went About a Housing Job.* Joseph Meltzer. (13) May 29.
Natural Draught Cooling Towers.* Harold Nielsen. (12) May 30.
Planning the Industrial Plant.* Hugh M. Wharton. (9) Serial beginning June.
Weighing Concrete Materials Saved Cement on Three Big Dams.* H. H. Hunt. (67) June.
The Complete Concrete House.* (67) June.
Breaking Up Concrete. (67) June.
Cast-Iron Pipe or Welded Pipe for House Drainage Calked-Joint *vs.* Screw-Joint, Wrought-Iron *vs.* Steel Pipe.* William Paul Gerhard. (6) June.
Foundation Subsidence of Portland's Grain Elevator. (Report of Committee read before Comm. of Public Works.) (117) June 1.
Supporting Blast Furnace While Replacing Foundation.* C. W. Lush. (13) June 5.
Builds Houses for Workmen.* (20) June 5.
Production of Albany Molding Sand.* Robert W. Jones. (20) June 5.
Tests of Two Recent Theories for Proportioning Concrete.* G. M. Williams and Watson Davis. (13) June 12.
Pneumatic Caissons Sunk Through Moving Ground.* (13) June 12.
Methods of Preventing the Transmission of Vibrations in Buildings.* A. B. Eason. (26) June 13.
Cement Gun Built Walls and Roof of Army Warehouses.* (13) June 19.
Surface Aggregate or Fineness Modulus for Concrete.* (13) June 19.
Formula and Table of Weights, Steel Roof Trusses.* Marshall L. Murray. (86) June 25.
The Surface Area and Fineness Modulus Methods of Grading Concrete Aggregates.* Duff A. Abrams. (86) June 25; (96) June 26.
Studies in Surface Area Proportioning Method.* R. B. Young. (96) June 26.
Emergency Seasoning of Sitka Spruce.* L. A. Welo. (19) June 28.
Industrial Lighting.* C. E. Clewell. (Paper read before Illuminating Eng. Soc.) (3) July.
The Phenomena of Drying Wood.* Harry D. Tiemann. (3) July.
Lignum-Vitæ, the Vital Wood.* James J. Record. (19) July 5.
Concentrated Load Tests of Yellow-Pine Beams for Shear.* L. R. Manville and C. R. Hill. (13) July 10.
Concrete Building Addition Made at Reasonable Cost.* (13) July 10.
Building the New Orleans Army Supply Base.* (13) July 17.
Pressing Out Mix Water Adds to Cement Mortar Strength.* C. T. Wiskocil. (13) July 17.
Swimming Tank on Third Floor of Concrete Building.* L. R. Viterbo. (13) July 17.
Les Appareils pour l'Injection du Mortier sous Pression.* L. Biette. (33) Feb. 15.
Calcul des Voutes Paraboliques.* L. Robert de la Mahotière. (33) Mar. 8.

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Moyens de Protection Employées par les Allemends Contre la Rouille de leur Matériel de Guerre en Acier. (33) Mar. 15.
L'Etude et la Représentation Graphique des Propriétés des Bronzes d'Aluminium.* R. de Fleury. (33) Mar. 29.
Recherches des Sections Economiques des Poutres Simples en Béton Armé Travaillant à la Flexion. G. Guillaumin. (33) Mar. 29.
La Destruction par les Allemands des Voies Ferrés, des Routes et des Voies Navigables, Mesures Prises pour leur Reconstruction.* (33) Apr. 5.
L'Etude des Propriétés des Bronze d'Aluminium. Jean Durand. (33) Apr. 19.
Nouvelle Méthode de Calcul et Propriétés Diverses des Poutres à Travées Solidaires.* P. Sonier. (33) Apr. 19.
L'Emploi de Coffrage en Tole pour le Moulage du Béton et pour la Construction des Maisons.* (33) Apr. 26.
Calcul de l'Effort du Vent dans les Toitures en Arc. F. Grua. (33) May 31.
Flandrische Edelsitze. Hans Vogt. (49) Serial beginning Pt. 1.
Deutsch-Gotisches.* D. Hasak. (49) Serial beginning Pt. 1.
Die Vorkarolingische Basilika St. Emmeram in Regensburg und ihre baulichen Anderungen im ersten Halbjahrtausend ihres Bestandes (740 bis 1200).* Franz Schwäbl. (49) Serial beginning Pt. 1.
Die Einflusslinie für die in einem Punkt rotierende Lasteinheit.* O. Fröhlich. (78) Jan. 1.
Die Wirtschaftlichkeit der Abmessungen beim Plattenbalken.* Max Mayer. (78) Jan. 1.
Die Neubauten des Hauses der Dresdner Kaufmannschaft, der Handelskammer und der Gewerbekammer in Dresden.* (40) Serial beginning Jan. 1.
Holz als Ersatz des Eisens in der Zugbewehrung. (78) Serial beginning Jan. 1.
Riss- und Rostbildungen an Tragwerken aus Eisenbeton.* K. Haberkalt. (53) Serial beginning Jan. 3.
Zur Frage der Knickbeanspruchung beigungssteifer Fachwerkstäbe.* H. Müller-Breslau. (40) Jan. 4.
Dienstanweisung für die Bezirkswohnungsaufsichtsbeamten. (40) Jan. 7.
Einheitformen im Hochbau.* (40) Jan. 11.
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Entwurf zu einer Wohnungsordnung. (40) Jan. 15.
Die evangelische Garnisonkirche mit Kriegergedächtnishalle in Allenstein.* Ludwig Dihm. (40) Serial beginning Jan. 18.
Die Ausstellung "Sparsame Baustoffe" in der Ausstellungshalle am Zoologischen Garten in Berlin. Uber. (40) Jan. 25.
Die neue städtische Volksschule an der Pfarrhofstrasse in München-Giesung.* (40) Serial beginning Feb. 1.
Verschiedene Zement- und Betonkonstruktionen hinsichtlich ihrer Verwendbarkeit Herstellungsweise und einiger Ausbauarten (nach Beispielen).* Kropf. (78) Feb. 5.
Ersatz für Eisenbauten. W. Petry. (78) Feb. 5.
Beton und Eisen auf der Ausstellung "Sparsame Baustoffe" in Berlin.* Heinrichs. (78) Feb. 5.
Stadt- und Landhäuser in Ostpreussen.* Lange. (40) Feb. 15.
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Ueber Sparmassnahmen im Eisenbetonbau. (107) Mar. 1.
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Weitere Untersuchungen über Rostschutz. Bruno Zschokke. (107) Serial beginning May 17.
Die Lutherkirche in Freiburg i. B.* Hans Christen. (107) May 17.
Die Einflusslinien des Kontinuierlichen Trägers auf drei Stützen.* Ernst Laube. (107) May 17.

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Surveying and Mapping from Airplanes. E. Lester Jones. (Paper read before Pan-Am. Aeronautic Convention.) (19) June 21.
Rules for Drafting Practice.* H. N. Savage. (13) July 17.
Intégraphe Predhumeau-Secrétan.* Predhumeau. (43) Jan.
Geländedarstellung auf Karten.* Walter Blumer. (107) May 17.

Water Supply.

A Study of Water Supply for Budget Purposes.* William W. Brush. (59) Mar.
Further Studies on Gentian Violet as a Means of Eliminating Spurious Presumptive Tests for B. Coli in Water.* Ivan C. Hall and Lillian Jordan Ellefson. (59) Mar.
Economical Construction of a Creek Crossing (Water Main.) John F. Mead. (59) Mar.

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Mayreau de l'Imprimerie Simplifiée par l'Art Allemand. Centre la Famille de Sept Enfants. Journal de Guerre en Arabe. (432) Mar. 12.

L'Étude et la Reconstruction Graphique des Propriétés des Formes d'Assemblage.* (Étude et la Reconstruction Graphique des Propriétés des Formes d'Assemblage.*

B. de Photo. (43) Mar. 19.

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La Construction par les Allemands des Voies Ferrées, aux Environs de Nos Voies Ferrées, Comme Leçons pour Leur Reconstruction.* (432) Mar. 5.

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Photographie Judiciaire. Hugo Voss. (40) Serial beginning Jan. 1.

Journey-Problems.* O. Hessel. (40) Serial beginning Jan. 1.

Die Verbrechenslehre Goethes. Ein Kommentar zu Dichtung und Ihre Deutungen (Die Verbrechenslehre Goethes. Ein Kommentar zu Dichtung und Ihre Deutungen.) (40) Serial beginning Jan. 1.

Zwei Romane. (40) Serial beginning Jan. 1.

Die Rheinschiffahrt (or die in einem Fund enthaltene Lagerung).* H. Fröhlich. (78) Jan. 1.

Die Strafgesetzgebung der Atomkriegen beim Patentschutz.* Max Meyer. (78) Jan. 1.

Die Neuordnung des Impfens der Deutschen Kriegsgefangenen, der Impfschutzmann und der Impfschutzkämpfer in Impfung.* (40) Serial beginning Jan. 1.

Hilfe als Pflicht. Ein Roman in der Kriegszeit.* (78) Serial beginning Jan. 1.

Blitz- und Impfschutzgegen an Tragwerken aus Eisenbeton.* K. Hilgenfeld. (78) Serial beginning Jan. 8.

Zur Frage der Kriegsentschädigung Deutschlands.* H. Müller-Breslau. (40) Jan. 1.

Die Neuordnung über die Haftpflichtversicherung (40) Jan. 1.

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Entwurf zu einer Wohnungsordnung. (40) Jan. 15.

Die geographische Verbreitung der Kriegsgefangenschaft in Elsass.* Ludwig Thoma. (40) Serial beginning Jan. 15.

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Die neue staatliche Fürsorge in der Fürsorgeschule in Mannheim-Ludwigshafen.* (40) Serial beginning Feb. 1.

Verschiedene Gesetze und Verordnungen, hinsichtlich ihrer Verwendbarkeit. (Verschiedene Gesetze und andere Anordnungen (durch Bekanntmachung).* (Engl. (78) Feb. 2.

Stadt für Bauingenieur. W. Petri. (78) Feb. 8.

Stadt- und Landplaner in Österreich.* Lange. (40) Feb. 12.

Bauordnung und Landplaner in Österreich.* Lange. (40) Feb. 12.

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Wettbewerb für ein Bauerndorf in Schwyz. (Wettbewerb für ein Bauerndorf in Uri.) (107) Apr. 5.

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Die Ausbreitung in Frankreich.* H. K. Hanna Chrysler. (107) May 17.

Die Ausbreitung in Frankreich.* H. K. Hanna Chrysler. (107) May 17.

Die Kommunalbauten des Kontinentalen Typhus auf drei Abwegen.* Ernst Lemke. (107) May 17.

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Surveying and Mapping from Airplane. E. Lester Jones. (Paper read before Am. Soc. Aeronautic Engineers.) (40) June 29.

Rules for Drafting Treaties.* M. K. Sarkis. (43) July 17.

Deutsche Landesaufnahmen.* Freihammer. (43) 1910

Schwabenkriegführung auf Karten.* Walter Hummer. (107) May 17.

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A Study of Water Supply for Hilton Portmore.* William W. Brush. (39) Mar.

Water Profile as Useful Type as a Means of Illustrating Certain Preventive Measures for R. Coal in Wells.* Hugo C. Ruhl and Clifton Jordan McKean. (39) Mar.

Bacteriological Contamination of a Creek Changing Water Main. John R. Mead. (39) Mar.

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Models of Structures in the Catskill Aqueduct System.* (59) Mar.
Thawing Frozen Service Pipes.* A. W. Cuddeback. (59) Mar.
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Frozen Water Services in the Borough of Queens. John T. Metcalf. (59) Mar.
Meters; Oversizing. William R. Edwards. (59) Mar.
New Meter Rates in the San Francisco District.* Allen Hazen. (59) Mar.
Repairs to Risers in the Shafts of the City Tunnel of the Catskill Aqueduct. J. Waldo Smith. (59) Mar.
Garden Pools.* Charles Dowing Lay. (119) Apr.
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Design of Hydro-Electric Plants for Combatting Ice Troubles.* R. M. Wilson. (5) May.
Opportunities for and Data on Small Municipal Hydro-Electric Plants.* Wm. G. Fargo. (60) May.
The High Service Reservoir of the St. Paul, Minn., Water Works.* W. N. Jones. (60) May.
Rainfall, Absorption and Run-Off on Small Rural Drainage Area.* Ivan E. Houk. (13) May 1.
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